E, 1958

CHNOLOGY DEPT.

nts, page 352

RUBBER WORLD

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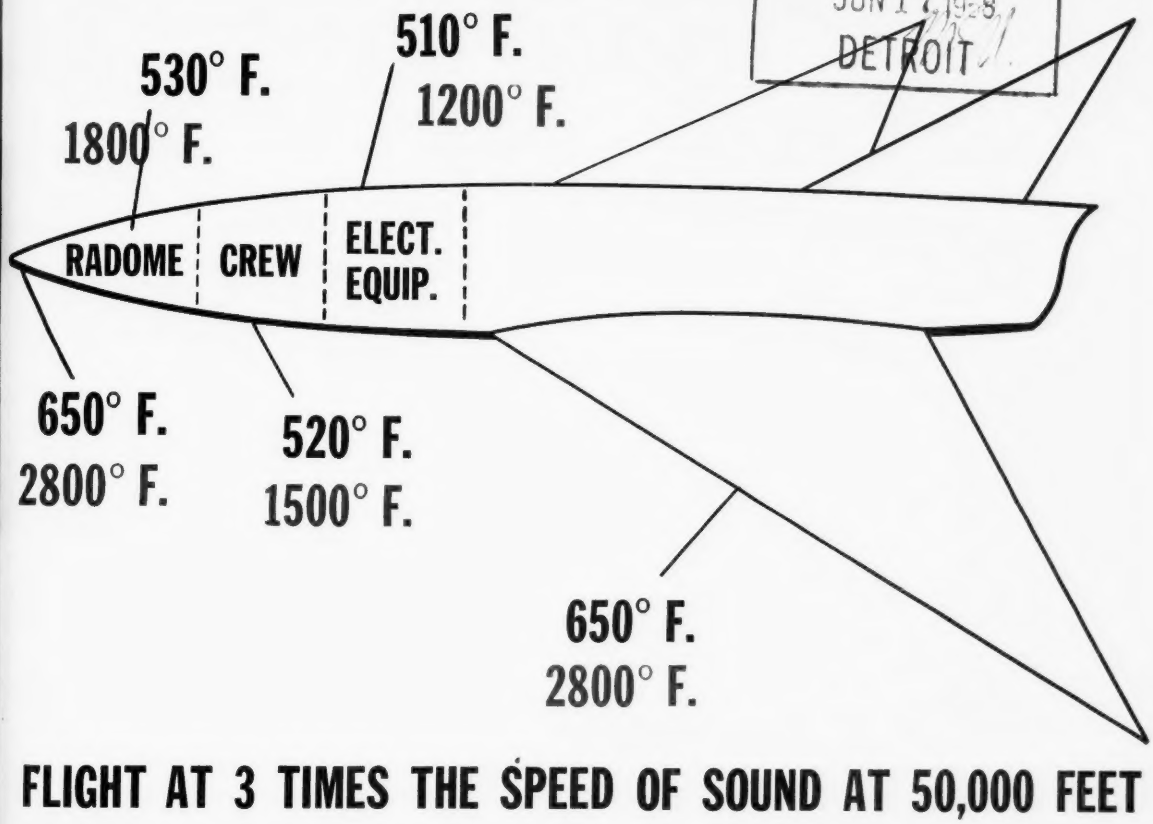
TYPICAL AIRFRAME OPERATING TEMPERATURES



FLIGHT AT 3 TIMES THE SPEED OF SOUND AT 50,000 FEET

FLIGHT AT 7 TIMES THE SPEED OF SOUND AT 100,000 FEET

WADC Indicates Rise in Aircraft Material Service Temperatures (page 430)

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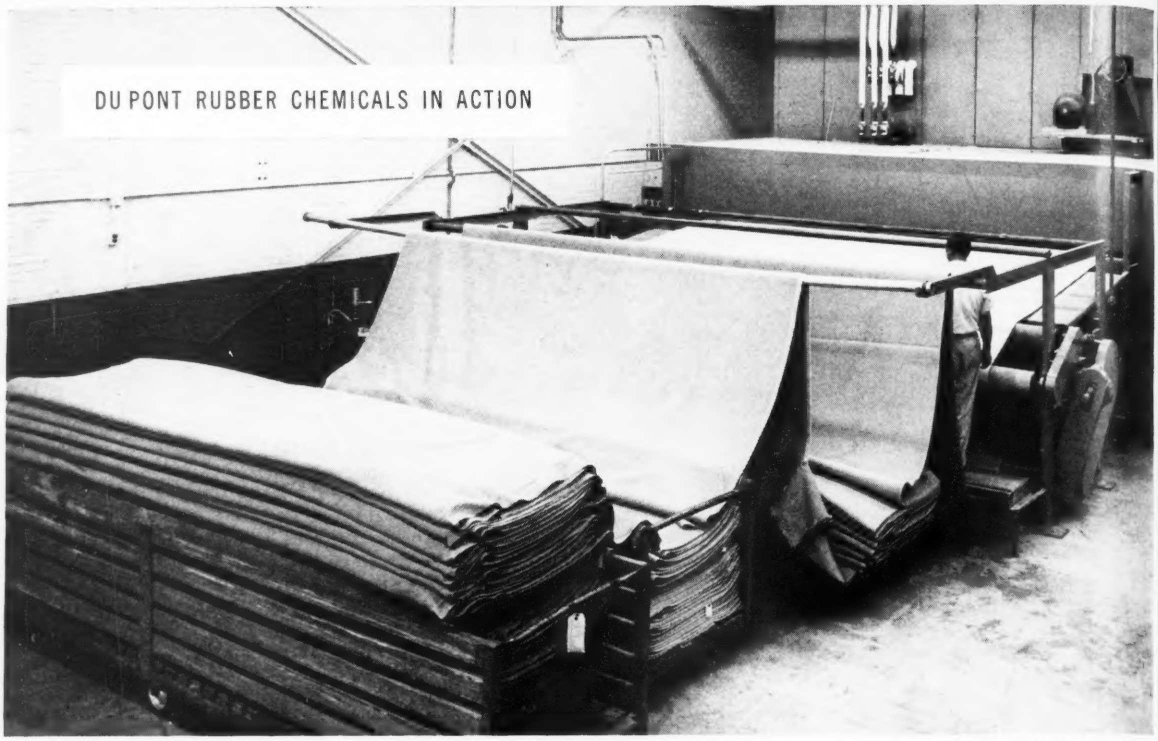
CORD PROCESSING AND CURING OF NYLON TIRES

By Patterson, McCrea, and Howe, page 409



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BETTER NYLON TIRES WITH LESS CORD

Nylon cord processed by a two-step process permits a reduction of 10% in the cord content of a tire. Post inflation after tire curing is effective in reducing tire growth and concavity. **409**

DIRECT POLYETHYLENE BONDING NOW POSSIBLE

A new bonding process now makes possible direct adhesion of polyethylene to rubber, brass or brass-plated metals. **418**

NEW CURING TECHNIQUE USES ZEOLITE ADSORBENTS

Volatile curing agents adsorbed on synthetic zeolites bring new approach to "delayed action" accelerator curing technique. **424**

PUBLIC SUPPORT NEEDED FOR NEW LABOR LAWS

If corrective labor legislation is to be passed by Congress, the public as well as labor will have to get its thoughts before the Congressmen. **407**

ELASTOMERS FOR HIGH TEMPERATURES REVIEWED

Means of achieving high-temperature resistance for elastomers were reviewed, and the 1958 Goodyear Medalist was announced at Rubber Division, ACS, meeting. **428**

NATURAL RUBBER'S POTENTIAL EXAMINED

Details of natural rubber production, chemistry, and economics were examined at April meeting of Akron Rubber Group. **432**

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Cover Photo: Courtesy of L. D. Richardson, Wright Air Development Center

The opinions expressed by our contributors do not necessarily reflect those of our editors

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How to compound PARACRIL to make belting and hose jackets that:

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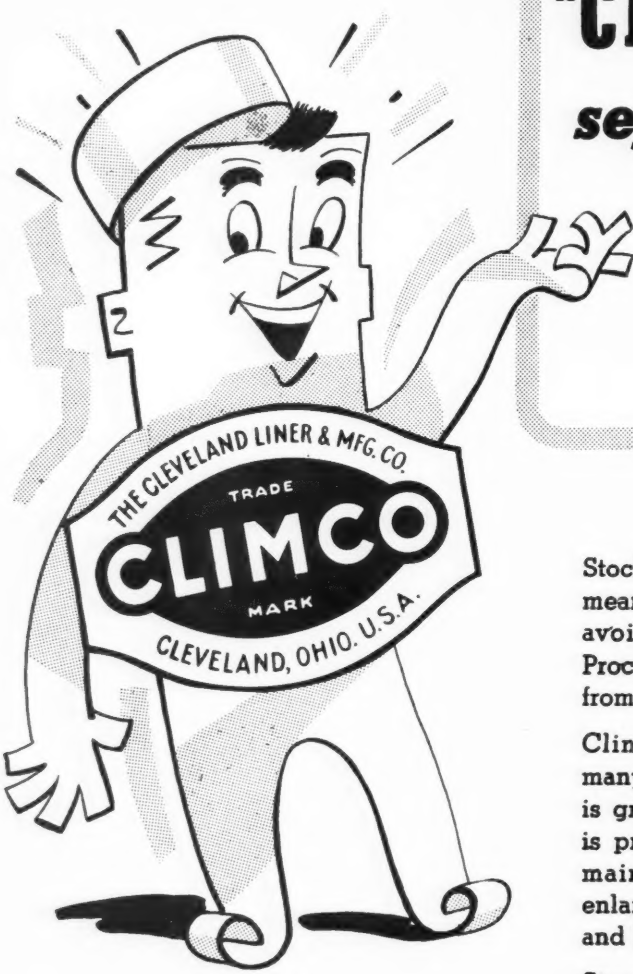

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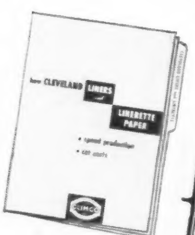

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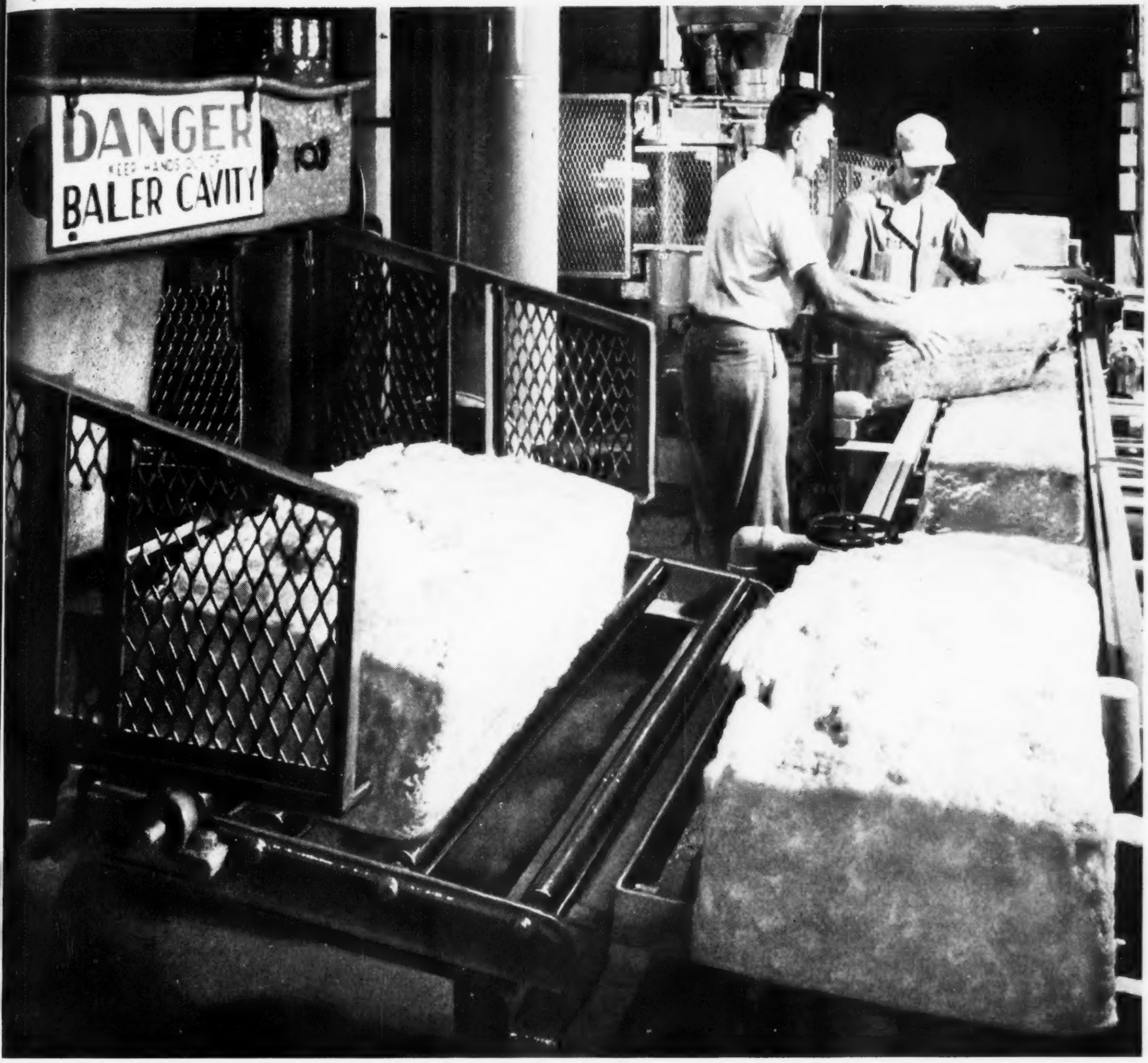
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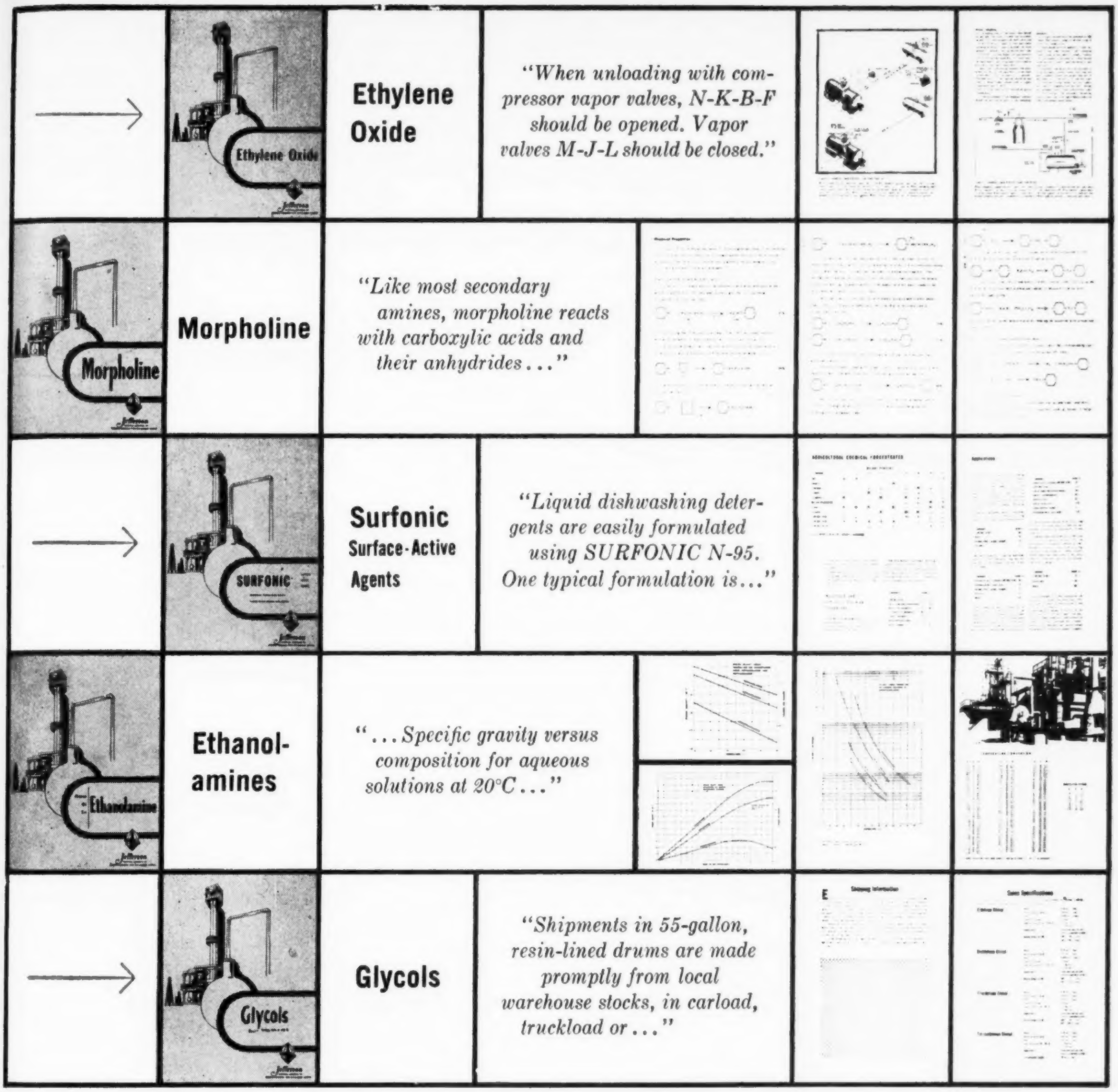

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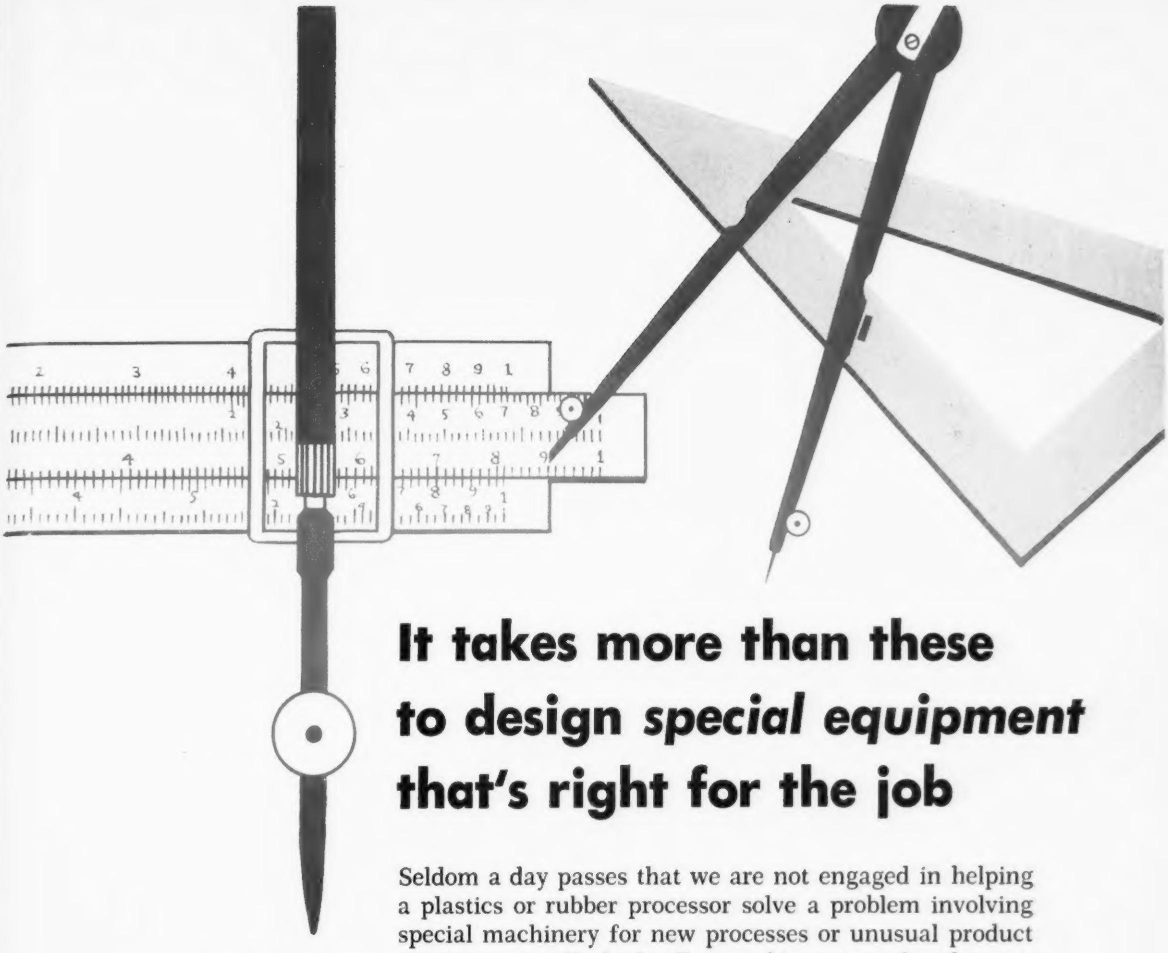
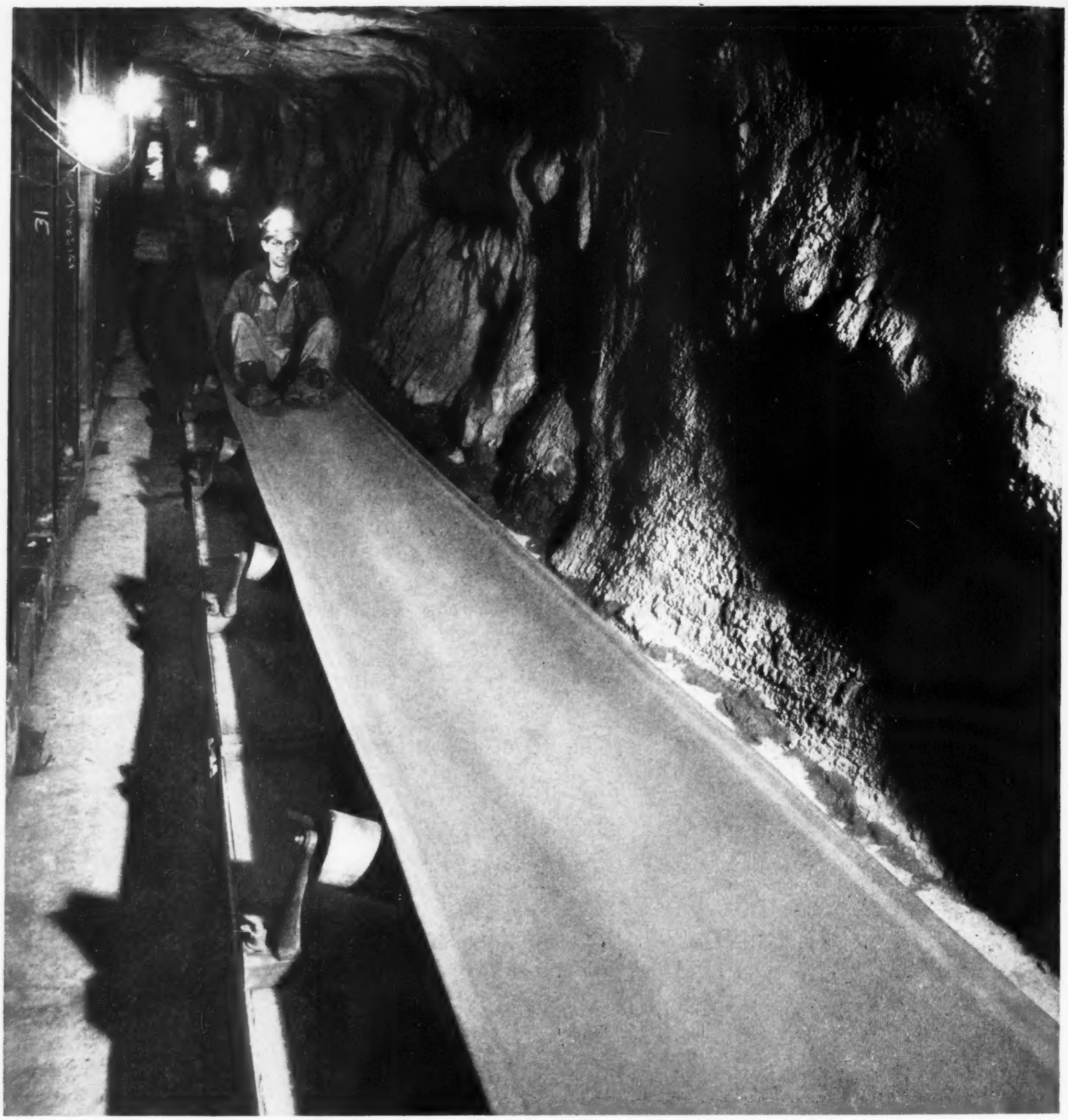
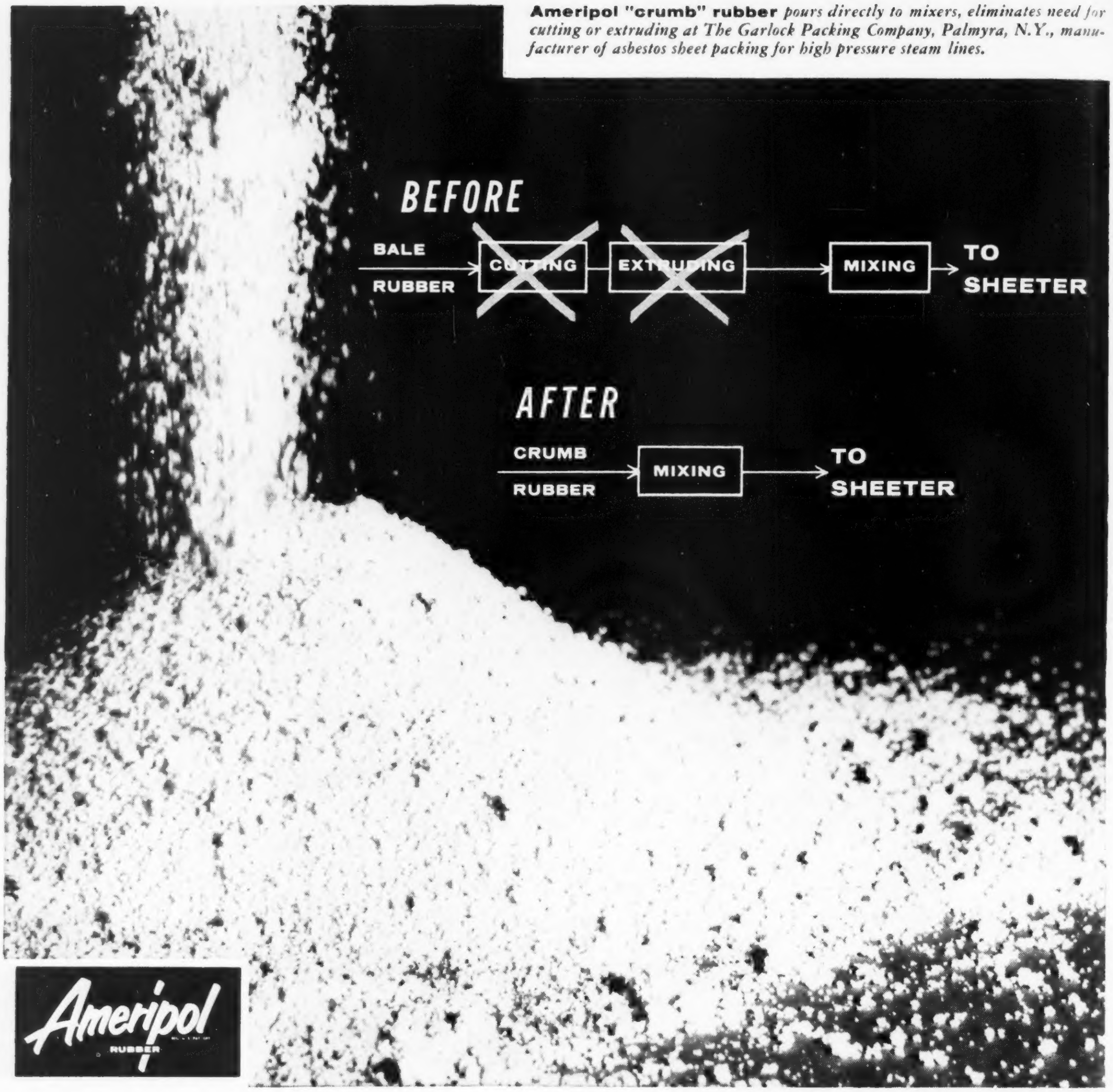




Ameripol "crumb" rubber *pours directly to mixers, eliminates need for cutting or extruding at The Garlock Packing Company, Palmyra, N.Y., manufacturer of asbestos sheet packing for high pressure steam lines.*



eliminates two processing steps; cuts mixing time in half!

Processing costs really tumbled when The Garlock Packing Company switched to Ameripol "crumb" polymers as the adhesive filler for asbestos sheet packing. New "crumb" Ameripol goes right into the mixer with no prior processing. Formerly, it was necessary to cut and extrude rubber to convert it to spaghetti-like form before mixing.

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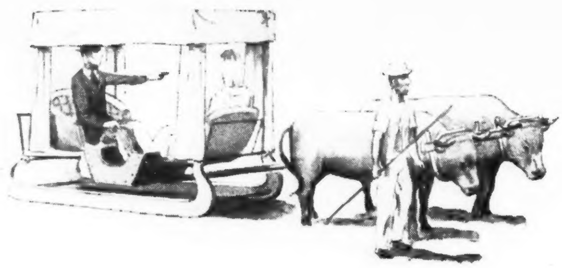

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Dixie 20, Semi-Reinforcing (SRF) furnace carbon black, boasts by far the widest applications in various types of rubbers, and is indispensable to ever so many compounders.

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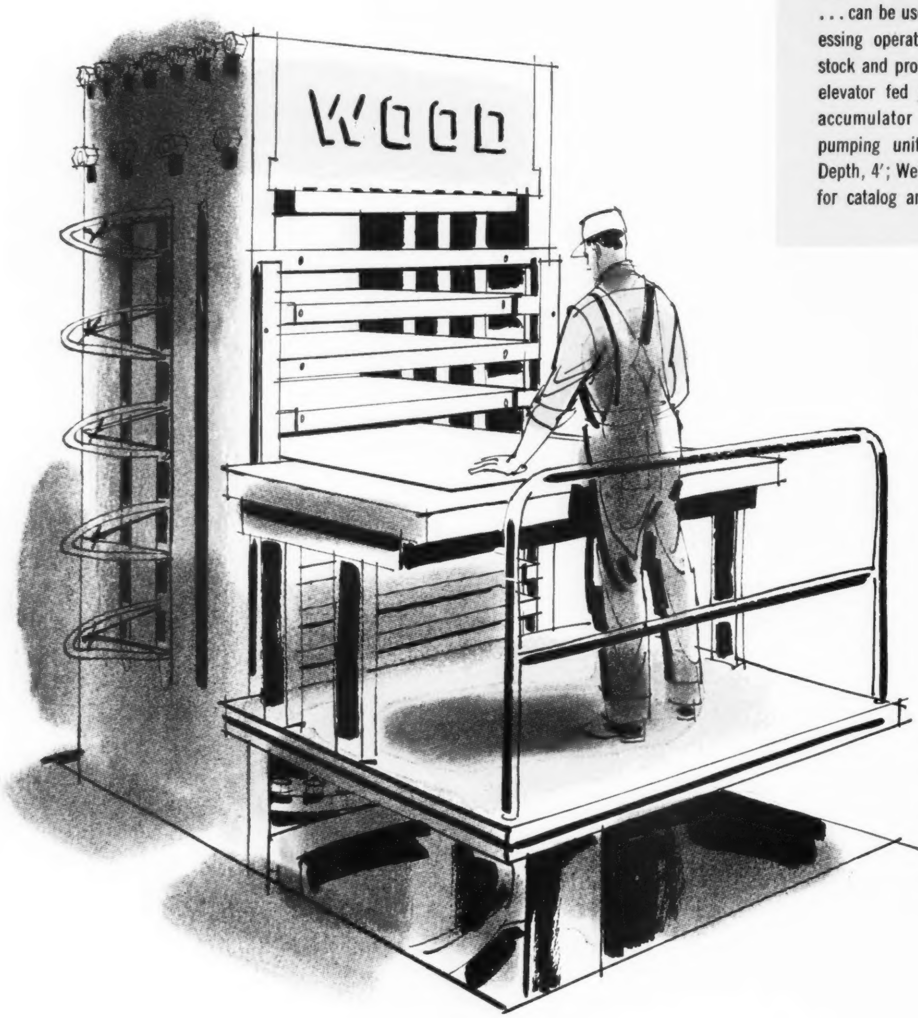

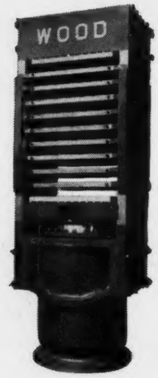

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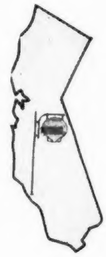

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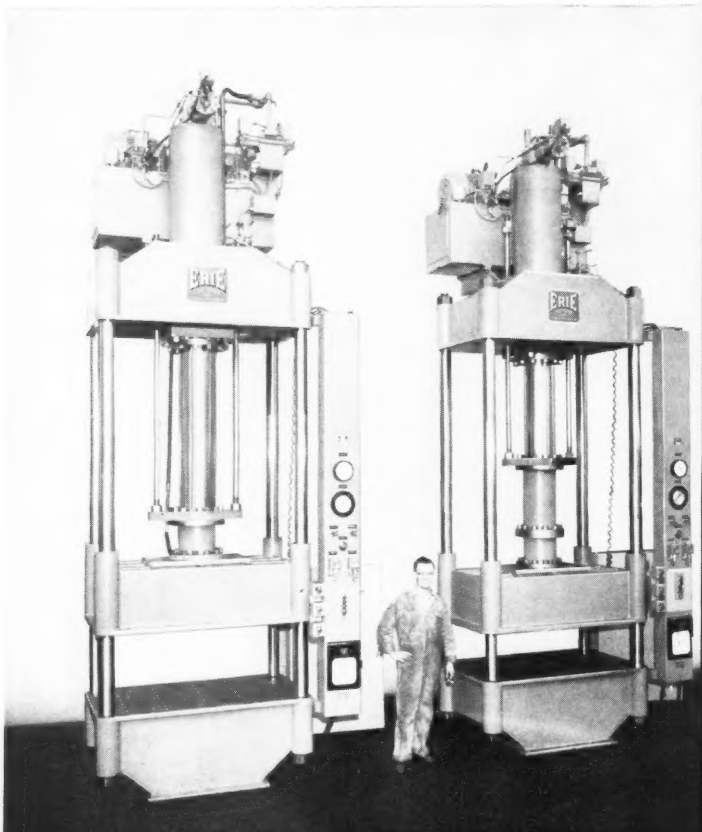
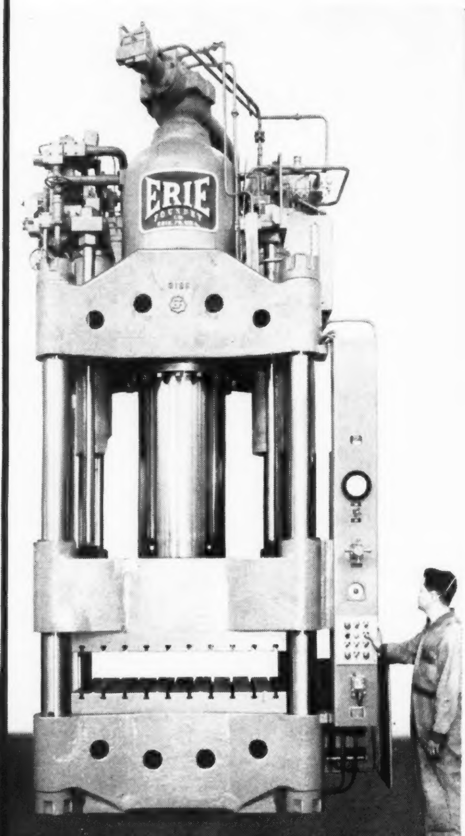


This very rugged fiberglass press is rated 750 tons with a 48" stroke. The two pull backs give 150-ton stripping capacity. Oil Gear drive with quick-acting prefill system allows molders to utilize five ram speeds in their molding cycle. Automatic short stroking of pump at required pressures for long periods of time assures both reduced h.p. consumption and oil heating. Controls are semi-automatic, and the 2 steam-heated platens are 60" x 46".



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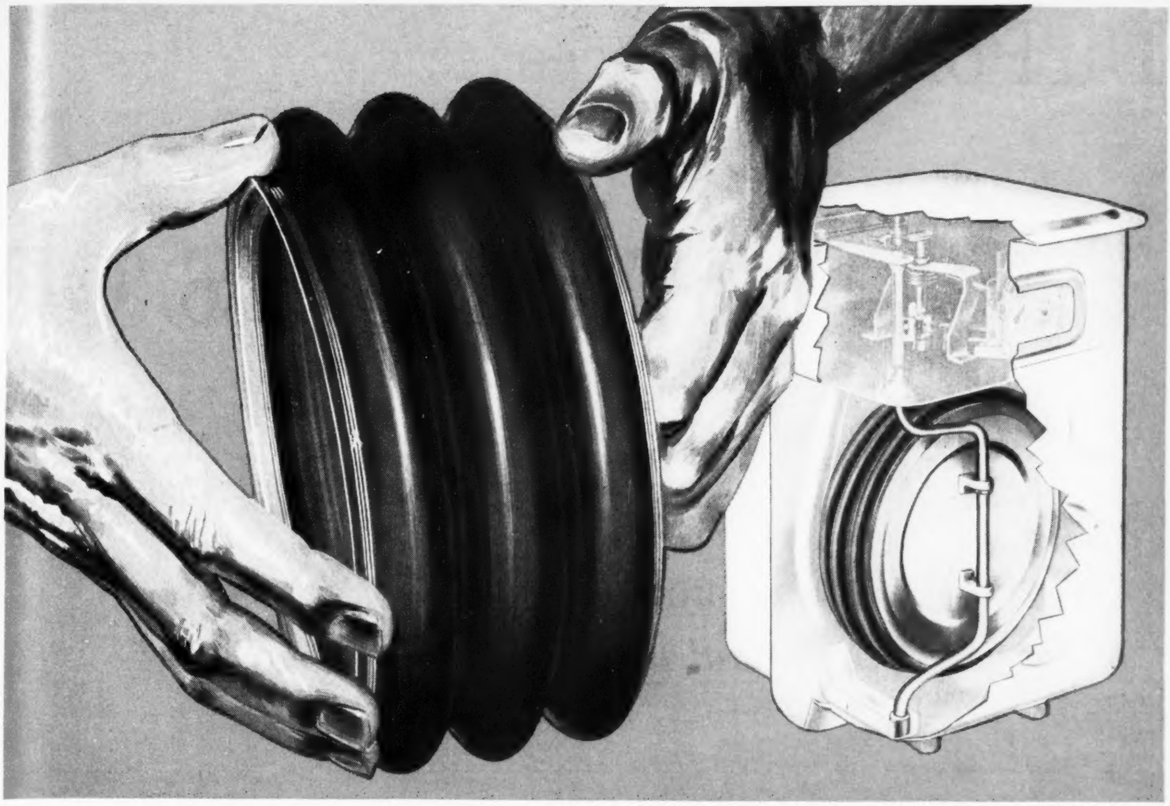

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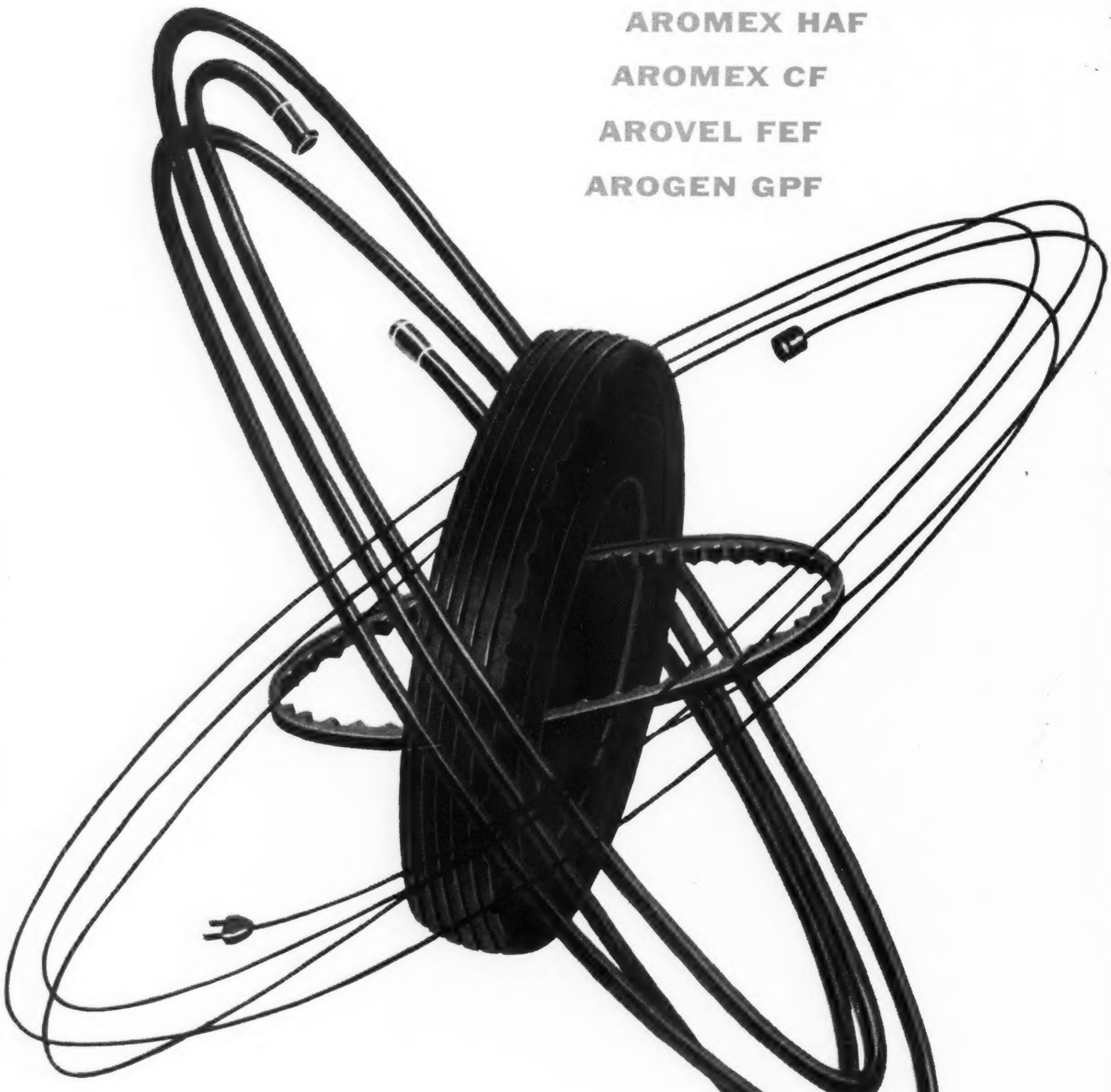

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RUBBER WORLD

EDITORIAL

Prospects for Labor Legislation

LABOR-MANAGEMENT problems are very much in the forefront in Washington and many other places at the present time. How the two-year-old strike of the United Rubber Workers against O'Sullivan Rubber Corp. has contributed to the stalemate in Congress over new labor legislation is detailed in our Washington Report by John F. King elsewhere in this issue.

Ralph Robey, of the National Association of Manufacturers, in a column made available to RUBBER WORLD and other business publications in mid-May takes the position that there will be a labor bill of some kind introduced in the Senate in this session of Congress, but that odds are heavily against the House taking comparable action. He explains that such a bill was promised by Senate Majority Leader Johnson in his successful fight against amendments offered by Minority Leader Knowland to the Welfare-Pension Fund Bill which was passed by the Senate and is now in the hands of the House Labor Committee.

Dr. Robey feels that unfortunately the bill which will be introduced in the Senate is not likely to touch on the really basic problems of the labor situation as it exists today. Among the most important problems, he says, are:

1. The monopoly power of labor union bosses which is evident in practically all of our mass-production industries and which amounts to complete and absolute control over the immediate economic life of workers; and, as a result, union leaders can shut down any of the companies in one of these industries, or the industry as a whole. Employers either accede to demands or take strikes which may be competitively or perhaps financially ruinous.

2. The power of union bosses rests upon a combination of court decisions and compulsory membership in their unions. Court decisions have been to the effect that labor unions do not come under the restrictions of anti-trust laws. Unions, therefore, are free to do things which would be illegal for management.

3. Secondary boycotts are of various kinds and are frequently used to force producers, with whom the union has no direct conflict, to support demands on other companies. Such boycotts are prohibited by law, but, again, through a series of judicial decisions, the prohibition has been made almost meaningless.

4. Under law a state has the right to legislate in fields of labor, and all of them have done so. Under a decision of the United States Supreme Court, however, this right has been for all practical purposes wiped out. If the National Labor Relations Board refuses to act upon a particular abuse, the employer has no effective redress because the Supreme Court has said that the NLRB has preempted the field. It was clearly never the intention of Congress to create such a situation, but it does exist.

Each of these problems is more or less the result of judicial decisions. None can or will be corrected without legislation, and to get such legislation will require substantial evidence that the public firmly believes that correctives are urgently needed. Labor spokesmen are presenting their side, and members of Congress are impressed, but those in favor of solving such problems are not making an equally impressive showing. If worthwhile corrective legislation is to be adopted, every thoughtful citizen should feel an obligation to let his Congressmen know what he thinks, Dr. Robey says, and to this position RUBBER WORLD subscribes most heartily.

R. G. Seaman

EDITOR

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VENUE
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RUBBER WORLD

By R. G. PATTERSON, H. H. McCREA, and D. E. HOWE

Textile Fibers Department, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

AN IMPORTANT feature of modern processing of high-tenacity nylon cord for tires is the hot stretching operation. This process, which is usually combined with the application of an adhesive, yields cords with improved strength and lower growth properties. The extent to which these improved properties carry over into improved tire performance, however, depends on both the hot stretching and tire curing conditions. Curing may supplement or actually reduce the effectiveness of the hot stretching operations.

In view of the importance of both cord hot stretching and tire curing on the properties of nylon tires, a study was undertaken with improved Type 700 nylon to determine the effects of specific variables in each process, and to establish the relation of changes in one process to changes in the other. Type 700 nylon, an 840 denier, nine-gram per denier yarn, is a higher strength nylon characterized also by outstanding resistance to heat and has improved fatigue resistance and increased toughness.

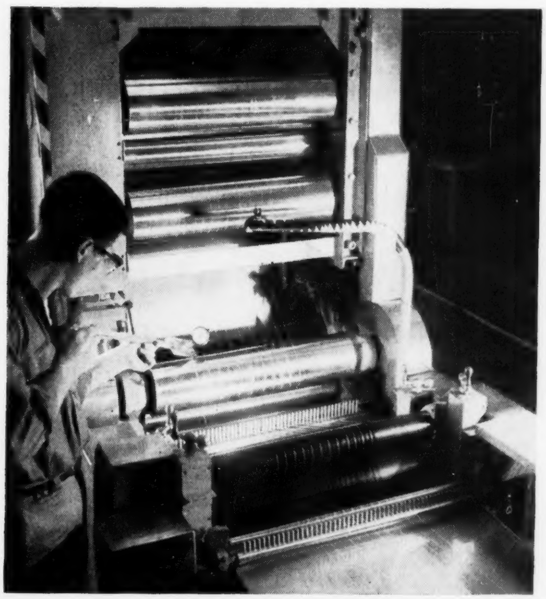


Fig. 1. Multiple-end Walter Kidde Co. tire cord dipping machine

Experimental Techniques

Cord Processing and Testing

Cord was processed on either a single-end machine (a modified Steele[1] machine) or a multiple-end unit (modified Kidde[2] machine). (See Figure 1.) The process consisted of applying the adhesive dip followed by stretching with the time, tension, and temperature specified for each experimental condition. The tension was applied for the full time specified, but the temperature indicated is oven temperature and does not necessarily reflect cord temperature throughout the whole time interval. In two-step operations the cord was processed through the machine twice, with water being applied in the first step, and adhesive in the second.

Standard cord physical tests were made at 75° F. 56% relative humidity (R. H.). Cord breaks were made on Instron[3] testers, using air-operated cord clamps and a traverse rate of 60% per minute (10-inch sample length).

Cord growth was measured at 75° F., 56% R. H., over a 30-minute period, using four-pound load which was afterward corrected to one g.p.d., (gram per denier) by means of a linear load-growth correction. Cord hot shrinkage was obtained by loading the cord with 0.01-g.p.d., measuring the length, heating to 160°

[1] W. M. Steele Co., Inc., Worcester, Mass.
[2] Walter Kidde Co., Belleville, N. J.
[3] Instron Engineering Corp., Quincy, Mass.

Cord Processing and Curing of Nylon Tires

Modern processing of nylon cord for tires requires a hot stretching operation usually combined with the application of an adhesive, and such processing yields cords with improved strength and lower growth properties. The extent to which these improved properties carry over into improved tire performance, however, depends on both the hot stretching and tire curing conditions.

When nylon cord processing was carried out in a single step, it was found that best balance of properties, which included minimum growth, shrinkage, shrinkage tension, maximum strength, and yards per pound, was obtained in the range of 12 to 15% net stretch.

Nylon cord processed first by the optimum one-step conditions of high temperature, relatively high tension, and moderately long time, and then followed by a second step using high temperature, low tension, and long time, produced cord with high tenacity, low shrinkage and growth, and thus represented a good balance of properties. Cord content per tire could be reduced 10% below that of tires when unstretched cord was used.

A three-step process was demonstrated also as a means of achieving the maximum utility of the fiber without sacrifice of desirable physical properties and further small decreases in the amount of cord used per tire.

The physical properties of nylon cord were found to be carried over into tire properties but the degree to which this occurred was dependent on the method of tire curing and on the shrinkage properties of the cord.

Post inflation was shown to be effective in the elimination of tread concavity normally found when cords with high shrinkage were used together with fast, hot cures. Even when cords of low shrinkage were employed, post inflation resulted in reduced tire growth, and it thus has become important to nylon tire manufacture.

C. (320° F.) for 30 minutes and again measuring the cord length while hot; the difference was expressed as a percentage of the original length. Cord shrinkage tension was measured by loading the cord at 0.01-g.p.d., then heating for 30 minutes at 160° C. while the cord was held at constant length. The tension developed was applied to an Instron load cell and measured on a modified Instron recorder.

Tire Fabrication and Testing

Tire plies were built by a single cord ply lay-up technique. The lay-up drum was not in series with either of the hot stretch units; hence the cord was always subjected to an intermediate packaging before the plies were constructed. The lay-up winding tension was controlled at about 0.5-pound.

During the manufacture of the plies the cord was given a treatment at 212° F. for a period of 2.5 minutes at 0.9-pound tension to decrease the amount of absorbed water. Cord was wound on to a layer of rubber stock placed on the building drum; another layer of stock was placed on top, and the sandwich pressed together with a loading of 500 pounds applied to a two- by four-inch roller.

Tires were 8.00-15 four-ply of a standard commercial design. They were built by standard techniques using drum settings typical of those used in the tire industry. Curing was carried out either in pot heaters or in a Bag-O-Matic[4] press. Where post inflation was used, the tires were removed from the Bag-O-Matic curing press as quickly as possible and, while still hot, were placed on a rim and inflated to the specified pressure. They were then permitted to cool in air for a length of time equal to the total curing cycle.

Tire Inflation Growth

Tires were mounted on a six-inch rim, seated immediately, bled to five psi. and permitted to remain at this pressure for 24 hours. Tire circumference was obtained as well as tire section width at four different locations. The circumference was corrected to section height after subtracting the rim diameter from the tire diameter. After measurement, tires were inflated to 24 psi. and held at that pressure at 100° F. for 24 hours, after which the measurements were repeated. Growth was determined from the difference between the five-psi. and 24-psi. measurements and expressed as a percentage of the measurement at five psi.

Tire Service Growth

Tire dimensions were measured after the 85-mph. portion of a step speed test. The difference between the 24-psi. measurement (from the inflation growth test) and the measurement after the 85-mph. speed was designated service growth test and was expressed as a percentage of the five-psi. measurement.

High-Speed Test

After measurement of inflation growth, tires were run in on a Bureau of Standards-type test wheel [(1/300-mile circumference, flat wheel, (no cleats)]

[4] McNeil Machine & Engineering Co., Akron, O.

R. G. Patterson

H. H. McCrea, Jr.

D. E. Howe

The Authors

R. G. Patterson, process development and research engineer, industrial products research laboratory, textile fibers department, E. I. du Pont de Nemours & Co., Inc., received his B.S. in chemical engineering from Ohio State University in 1945 and has been with the Du Pont company since that time.

Mr. Patterson is a member of the American Institute of Chemical Engineers and the Delaware Toastmasters Club.

H. H. McCrea, Jr., engineer, industrial products research laboratory, received his B.S. in mechanical engineering from Drexel Institute of Technology in 1955 and has been with Du Pont since graduation.

Mr. McCrea is a member of the Society of Automotive Engineers.

D. E. Howe, research supervisor, textile fibers department, obtained a B.S. degree from Mount Union College in 1937, an M.S. from Purdue University in 1939, and a Ph.D. degree from Iowa State College in 1942.

Dr. Howe was with the textile fibers department of Du Pont from 1942 until 1946 as a research chemist. From 1946 until 1955 he held a similar position with the Firestone Tire & Rubber Co. and then rejoined the textile fibers department of Du Pont as a research supervisor.

He is a member of the American Chemical Society and its Rubber Division, the American Society for the Advancement of Science, and the Akron Rubber Group.

for two hours at 60 mph. At the completion of the run-in period, the speed was increased to 75 mph. and held for one hour, then increased to 80 mph. for an hour and so on. After the 85-mph. period the tire was stopped, measured, and inspected, and then the speed was again increased in five-mph. increments until failure, with one hour's running being recorded at each speed. Starting pressure was 24 psi., and 110% of Tire Rim Association (TRA) loads used.

Dynamic Bruise Test for Crown Impact Endurance

A test wheel of the Bureau of Standards type was equipped with one cleat, on which was mounted a plunger at an angle of 45 degrees to a tangent to the wheel. (See Figure 2.) This plunger was 1.25 inches in diameter and of a length so that the radial distance from wheel to plunger tip was 2.5 inches. Tires were run at 115% of TRA load, 24-psi. inflation at 34 mph. (170 blows per minute) until tire failure occurred.

Fig. 2. Bureau of Standards tire test wheel equipped with one cleat and plunger

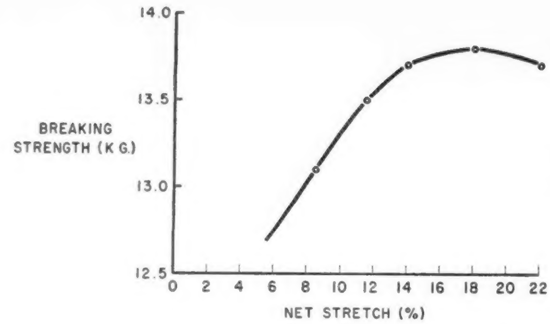


Fig. 3. Net stretch vs. breaking strength for Type 700 nylon after single-step stretching

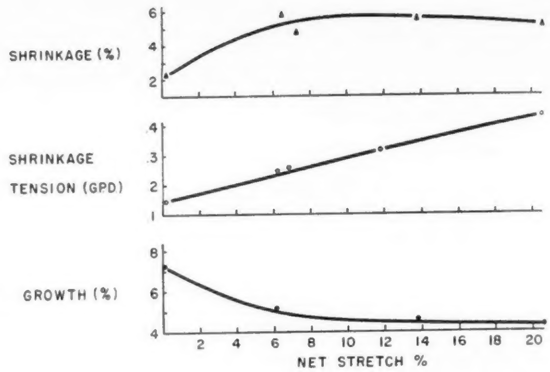


Fig. 4. Net stretch vs. stability for single-step cord treatment

Indoor Flex Test

In this test, tires were run in on overloaded, underinflated condition for 3,000 miles, after which cords were removed from the tire sidewalls, and their strength was compared with that of those removed from new tires. Actual running conditions were 18-psi. inflation at operating temperature, with loading adjusted to give 21% deflection while running (24% static deflection).

Tread Groove Cut Growth

Cuts were inserted in the grooves of test tires, after which the tires were run at 24-psi. inflation and 50 mph., with 110% of TRA loading for 350 miles, 150% of TRA loading for the next 800 miles, and 175% of TRA loading for the next 1,200 miles. The increase in length of the cuts was determined by direct measurement after 2,350 miles. This test was modeled after Federal Specification test No. ZZ-T-381-i.

Single-Step Cord Processing

The objectives of a nylon cord treatment are to reduce cord growth, to improve cord dimensional stability, to increase the cord modulus, to improve the cord tensile properties, and to increase cord yards per pound.

Cord modulus, strength, and yards per pound were found to be dependent primarily on net stretch, being only slightly affected by the other processing conditions. Cord stability and growth were also observed to be dependent on net stretch, but it was found that other processing conditions were equally important.

Figure 3 shows the change in breaking strength as net stretch was altered in a simple one-step stretching process. The progressive increase in strength with increase in net stretch points up a key feature of dip stretching in that it produces an increase in breaking strength per cord with a simultaneous increase in yards per pound, which means less fiber can do more work in a tire.

The stability properties of nylon cord, as determined by measurements of hot shrinkage and hot shrinkage tension, have been found to be important because they help determine the extent to which other desirable properties of the cord can be carried over into tire properties. For example, if high cord shrinkage forces bring about excessive cord shrinkage in the tire, then much of the benefit of high net stretch on cord strength and yards per pound will be lost.

Figure 4 shows the changes in hot shrinkage, shrinkage tension, and growth as net stretch was increased, while time and temperature were held constant. Conditions were 410° F., "X" pounds' tension or varying tension as net stretch was increased, and oven exposure time of 60 seconds. Hot shrinkage and growth were observed to change rapidly up to about 10% net stretch, after which further increase in net stretch had almost no effect. The effect on shrinkage tension was virtually linear, however, at least up to 20% net stretch.

When nylon cord processing was carried out in a single step, it was found that best balance of properties, which included minimum growth, shrinkage, shrinkage tension, maximum strength, and yards per pound, was obtained in the range of 12 to 15% net stretch. In the first three columns of Table 1 are listed results from three one-step processes: one characterized by high temperature, long-time and constant length (no stretch); one by mild stretching conditions involving only moderate tension and temperature and short time; and a third, somewhat more drastic, with increased time, temperature, and tension.

The conditions listed, (i.e., 410/1/120), expressed as degrees Fahrenheit, pounds of tension, and total oven-exposure time in seconds, apply to operations on a single-end processing machine. In order to obtain similar results (not shown) on the multiple-end machine, it was found necessary to employ about 25° F. higher temperatures and about one-third longer times, owing to differences in rate of heat transfer and temperature distribution between the two machines.

A comparison of these three sets of conditions (first three columns, Table 1) showed that with an increase in net stretch, breaking strength, yards per pound, and tenacity were increased, growth was decreased, and shrinkage tension increased, in a pro-

TABLE 1. COMPARISON OF VARIOUS STRETCHING METHODS IMPROVED TYPE 700 NYLON—STEELE MACHINE

		Constant Length	Mild One-Step	Optimum One-Step	Two-Step	Three-Step
Stretch Condition	1	410/1/120	375/6/30	410/8/60	425/8/42	410/8/60
	2				340/1.5/42	410/.8/120
	3					410/4/60
Net stretch, %		0	6.9	13.8	13.8	14.8
Yards/pound		2435	2570	2765	2765	2790
Break strength, kg.		12.7	13.1	13.9	13.2	13.3
Tenacity, g.p.d.		6.9	7.5	8.6	8.4	8.3
Relaxed growth, %		7.4	5.3	4.5	4.4	4.3
Shrinkage, %		3.0	7.0	5.4	4.0	3.8
Tension, g.p.d.		0.17	0.26	0.29	0.23	0.25

gressive manner. Shrinkage, however, was found to be highest when the intermediate stretch conditions were employed and was actually decreased by increasing the tension, provided time and temperature were also increased.

Two-Step Stretching

Improvements in cord stability were obtained with two-step processing. A typical process consisted of a stretching step at high tension and relatively high temperature, followed by dipping and a second heat treatment at constant length or a slight shrinkage. The second step involved lower temperatures than the first at longer times, or equivalent temperatures at times which were chosen for the best balance of performance and practicability. In the fourth column of Table 1 are shown results for a two-step process, chosen because it gives the same net stretch as the optimum one-step process, with considerably better shrinkage properties. The shrinkage tension, growth, and free shrinkage were found to be reduced. In this process, water was applied in the first step, and adhesive was applied in the second step.

Some experiments in which the net stretch was varied in the second step (again denoted by "X" pounds tension), resulted in the data shown in Figure 5.

Starting with a first step (dotted lines), using a net stretch which gave the properties indicated by asterisks on the graphs, a series of second steps (heavy solid lines) was added, allowing varying amounts of shrinkage during processing, so that the overall net stretch was reduced. As the net stretch was decreased in this fashion, a marked decrease in the hot shrinkage was observed, but very small changes in shrinkage tension and growth were experienced. These latter properties seemed to be reversible with net stretch to a much more significant degree than is hot shrinkage.

In a separate set of experiments the effect of both extended and curtailed processing time in the second step (denoted by "X" seconds) was determined. From the graph of Figure 6 it is evident that the major change was shrinkage, since both growth and shrinkage tension remained relatively unchanged. Thus by appropriate choice of conditions, specifically time and net stretch, significant alterations in the stability characteristics of nylon cords were achieved.

Three-Step Stretching

In Table 1 are given properties obtained with a three-step process compared with the one- and two-step results previously described. This process involved a total exposure time of four minutes, rel-

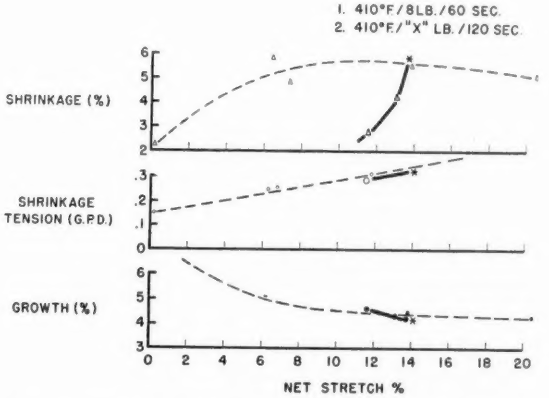


Fig. 5. Net stretch *versus* stability for the two-step cord treatment

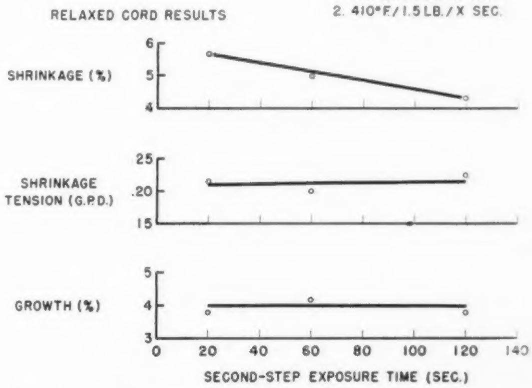


Fig. 6. Stability properties *vs.* second-step exposure time for two-step process

Table 2. Effect of Individual Steps in Three-Step Stretch Treatment

Improved Type 700 Nylon

Stretch Conditions 1	410/8/60	410/8/60	410/8/60
2		410/.8/120	410/.8/120
3			410/4/60
Net stretch, %	13.8	9.7	14.8
Yards/pound	2765	2635	2790
Break strength, kg.	13.9	13.3	13.3
Tenacity, g.p.d.	8.6	7.8	8.3
Relaxed growth, %	4.5	6.5	4.3
Shrinkage, %	5.4	3.0	3.8
Tension, g.p.d.	0.29	0.19	0.25

atively high temperatures, equivalent to that of the severe one-step operation, and consisted of stretching, relaxing, then a second stretching step.

The major feature of this treatment was that properties about equivalent to those of the two-step series were obtained, at about 1% greater net stretch and yards per pound. While the value of this increasing degree of stretch may be questioned, it is significant to note that a small saving in nylon fabric will quickly pay for additional equipment necessary. A nylon tire fabric processing unit, operating at 70 ypm., has the capacity to process 20,000,000 pounds of fabric per year. If 1% of this fabric were to be saved by increasing the amount of stretch, an annual saving of about $300,000 could be realized, which would ordinarily justify the additional ovens, pull roll stands, and control mechanisms necessary with multiple-step processing.

In the particular three-step process described, samples were taken after each of the steps and property levels were determined, in an effort to establish the magnitude of the changes taking place in each step. These are listed in Table 2.

The first step was essentially the optimum one-step process and had the same property levels. During the second step, with the application of only 0.8-pound at 410° F., the cord shrank about 4% (13.8 to 9.7%), and the property levels showed the effect of this change. Strength and tenacity levels were both reduced; growth was increased; but both shrinkage and shrinkage tension were sharply decreased.

When this procedure was followed with a third step, in which the cord was stretched about 5%, net stretch increased to a value even higher than found after the first step; yards per pound increased; strength and tenacity were slightly decreased: but when the third step is compared with the second step, growth was decreased about 2% while shrinkage increased less than 1%.

The effect of decreasing exposure time in the second step was determined (denoted by "X" seconds) and is shown in Figure 7. The most significant change was found in the shrinkage properties, which increase almost linearly with decreasing time. Tensile properties (not shown) were unaffected.

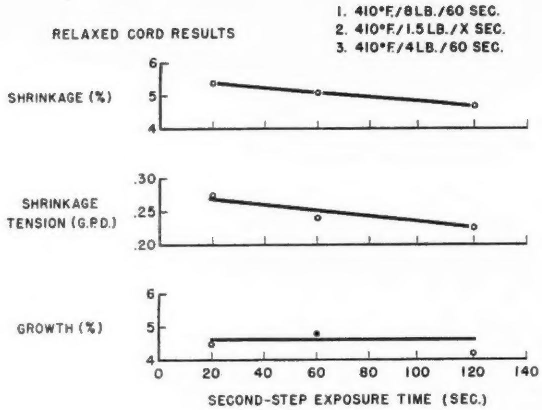


Fig. 7. Stability properties *vs.* second-step oven exposure in a three-step process

While no specific comment has been made about fatigue, the conditions described have yielded cords with satisfactory laboratory fatigue resistance.

The data indicated that a two-step series gave a more satisfactory balance of properties than a one-step process, and also that a three-step process was useful in obtaining the maximum utility of the fiber without sacrifice in desirable physical properties.

Tire Curing

During the curing operation the tire fabrics, as well as the elastomers, are subjected to heat, pressure, and tension. Although the temperatures used are lower than are ordinarily employed during hot stretching, processing times are much longer so that the net effect may approach that found during hot stretching.

In order to investigate the effects of variations in tire curing methods on nylon tire performance, improved Type 700 nylon cord was stretched under mild one-step stretching conditions, and the calendered fabric, which contained 32 epi., (ends per inch) was built into tires.

All of these tires were as nearly identical as they could be made in terms of drum sets, rubber stocks, and building conditions. Five different curing conditions were utilized. The control was a 60-minute pot heater cycle with a slow Bag-O-Matic cycle as a secondary control. This slow Bag-O-Matic cycle was essentially a fast cycle such as used for rayon cord tires plus four minutes' cooling; the cooling water was applied only to the inside of the bladder. In addition to these two methods, a fast Bag-O-Matic cycle was used with no further treatment, as well as with post inflation at two levels of inflation pressure, 30 and 50 psi. The tire properties studied included growth, high-speed performance, dynamic bruise resistance, flex resistance, cut growth, and, of course, the appearance of the tires from the viewpoint of whether or not the tread was concave.

In Figure 8 are shown the tire growth characteristics. Both inflation growth and service growth on the

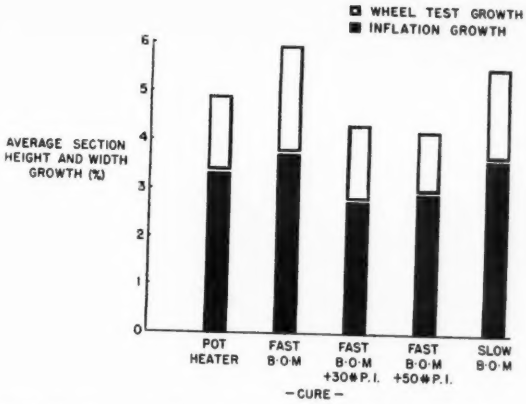


Fig. 8. Tire growth characteristics of improved Type 700 nylon cord tires (32 epi.) after various types of cures, with and without post inflation, and as measured by inflation growth and service growth after indoor wheel tests

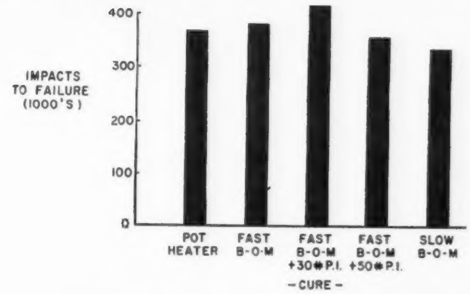


Fig. 10. Crown impact endurance as measured by dynamic bruise test for improved Type 700 nylon cord tires (32 epi.) cured by various methods and with and without post inflation

indoor wheel test were determined. It is apparent from this that post inflation gave a decrease in both inflation and service growth below that obtained with the other curing methods. As anticipated, the fast Bag-O-Matic cure without further treatment gave the highest growth; while the slow Bag-O-Matic and pot heater cures gave somewhat lower values.

Relatively little difference was found in the high-speed performance of these tires in a step speed test shown in Figure 9. Post inflation at a 50-psi. level gave high-speed performance equivalent to that of the pot heater control; while all of the other curing conditions gave tires which ran at about five mph. less than the control before failure.

Dynamic bruise resistance measured by a crown impact endurance was only slightly changed by variations in curing; all of the tires absorbed well over 300,000 impacts before failure (Figure 10).

During the flex test it was found that tires which were post inflated after curing gave first ply strength losses comparable to those of the pot cured tires (Figure 11). The fast Bag-O-Matic cure gave a somewhat lower strength loss than did the other methods of curing. This is not surprising since the tire shrinkage which occurred during the fast Bag-O-Matic process resulted in cord relaxation along with a small increase in twist, which would be expected to give better flex performance.

Tires cured in a fast Bag-O-Matic cycle showed an increase in rate of tread groove cut growth (Figure 12). Post inflation, particularly at the lower pressure level, decreased the rate of cut growth to below that of the control.

As a measure of tread concavity or flatness, the tread area of the unmounted, uninflated tire was used. The 8.00-15 tires which had a tread area of 435 square inches had a flat tread; whereas those having less tread area were concave, and those having a greater tread area were convex. Figure 13 shows that the fast Bag-O-Matic cure gave concave tires; whereas all of the other curing methods yielded either flat or convex treads.

The depth of flat spot in these tires was determined, and the data indicated that the process of post inflation produced a small decrease in flat spot depth below those of controls and of tires cured by the fast Bag-O-Matic cycle.

From these experiments it has been concluded that the properties of nylon tires built with mildly stretched cord are very much dependent on the methods by which the tires are cured. It is further apparent that the deficiencies seen when the fast Bag-O-Matic cure was used were overcome by post-inflation treatment.

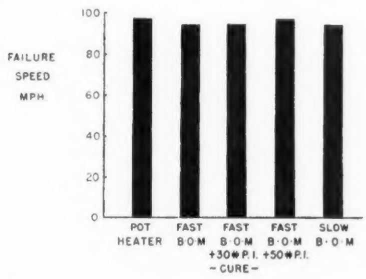


Fig. 9. Failure speed of improved Type 700 nylon cord tires (32 epi.) in high-speed wheel test, cured by various methods and with and without post inflation

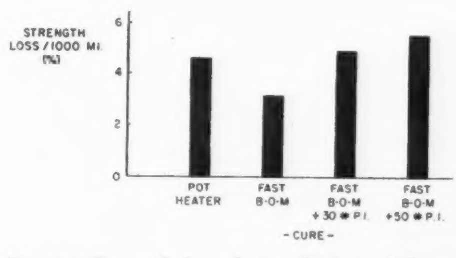


Fig. 11. Strength loss during flexing of Type 700 nylon cord (based on first ply) from tires run in an overloaded, underinflated condition on indoor test wheel. Tires cured by various means and with and without post inflation

Curing of Tires Made with Multiple-Step Processed Cord

Cord treatments designed to give improved cord stability were combined with different curing conditions and examined further. The three methods of stretching chosen were a one-step process using long time and high temperature, but very low tension; a second one-step process of high temperature, relatively high tension, and moderately long time; and a two-step series in which the first step was essentially the same as the one-step, high-tension process, followed by an annealing step at low tension, but with high temperature and long time.

Both of the latter two methods achieved the same net stretch level of about 11½%; while the first process yielded less than 1% increase in length, as shown in Table 3.

The first method gave low shrinkage and shrinkage tension, but high growth and low tenacity. The high tension one-step process yielded low growth, but high shrinkage and shrinkage tension. The two-step series, however, achieved both low shrinkage and low growth, and thus represented a good balance of properties.

Tires were made from these cords using the single-cord, ply-building technique, 29 epi. fabric, and ply widths, ply thickness, drum sets, beads, and treads which were identical. Cures used for these tires were fast or rayon-cycle Bag-O-Matic, slow Bag-O-Matic, which was fast Bag-O-Matic with four minutes' cooling, and a fast Bag-O-Matic plus post inflation at 50 pounds' pressure.

In Figure 14 are plotted dipped cord shrinkages in the standard hot shrinkage test, as well as cord shrinkage during cure. Shrinkage during curing was obtained by sewing in nylon yarns to selected cords spaced at intervals in the inner ply around the tire. The sewed-in yarns were about 18 inches apart on the cords, and the distances between these yarns were measured in the uncured tire and in the cured tire after cooling. The shrinkage figures are actual measured values and were not calculated from tire expansion formulae.

From an examination of the shrinkage characteristics of each type of cord processing through the various cures, it was concluded that this cord property was carried through into the tire, regardless of the manner of curing. With any particular curing method, cords with high shrinkage, as measured in the laboratory, had high shrinkage in the tire, and likewise cords with low inherent shrinkage gave low shrinkage during curing. The actual levels of shrinkage changed, however, as the curing method changed.

TABLE 3. CORD STRETCHING AND TIRE CURING—IMPROVED TYPE 700 NYLON—29 EPI. 800x15 TIRE

Cord Processing and Properties

Kidde machine stretch cond.	440°F./2 Lb./ 120 Sec.	445°F./7.5 Lb. /42 Sec.	440°F./8 Lb./ 60 Sec. 440°F./2 Lb./ 120 Sec.
Net stretch, %	0.7	11.4	11.5
Tenacity, g.p.d.	6.0	7.8	7.8
Cold growth, %	7.3	4.7	5.0
Hot shrinkage, %	4.0	7.1	3.5
Tension, g.p.d.	0.20	0.34	0.28

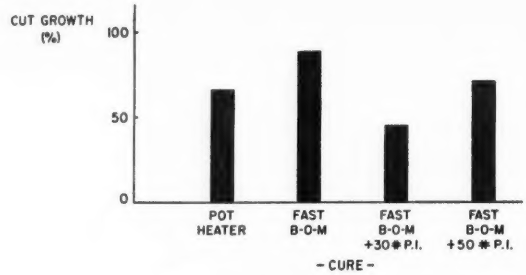


Fig. 12. Increase in cut growth in % of Type 700 nylon tires cured by various methods with and without post inflation. Test similar to Federal Specification No. ZZ-T-381-i

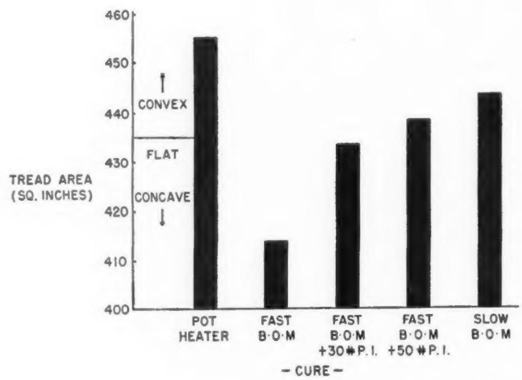


Fig. 13. Characteristics of tread area of Type 700 nylon tires cured by various methods with and without post inflation

The fast Bag-O-Matic cure gave the highest cord shrinkage of all the curing methods since the whole tire shrank; whereas those tires given a post-inflation treatment had the lowest cord shrinkage. The very low level of shrinkage in the tires built with low shrinkage cords, then post inflated after curing, was interpreted to mean that little fabric slip around the bead occurred, since these tires were still slightly smaller than the mold dimension when cold.

Only the tires cured with the fast Bag-O-Matic cure, using high shrinkage cords, were concave; all of the others had flat or convex treads.

In Figure 15 are given corresponding data on tire growth. Since it was found that the various curing processes employed changed the section contour of these tires, with resultant disturbances in the balance of section height and width growth, tread width growth, which is only slightly affected by these contour changes, was reported.

As with the shrinkage data, a direct carryover of

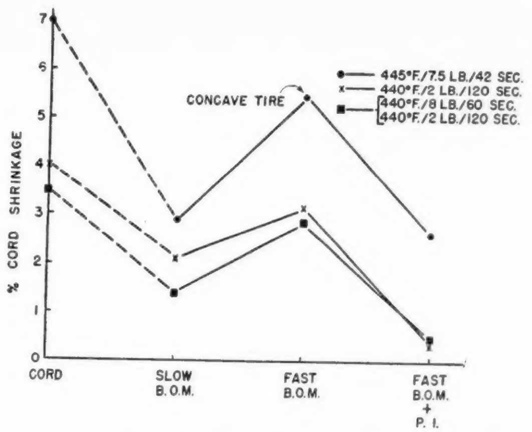


Fig. 14. Type 700 nylon cord shrinkage according to standard hot shrinkage test and special cord shrinkage during cure test for cord processed according to conditions in Table 3 and cured by various methods with and without post inflation

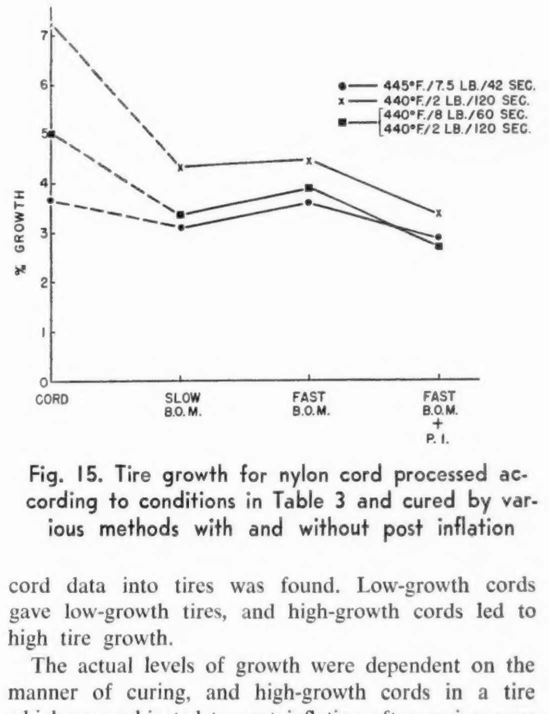


Fig. 15. Tire growth for nylon cord processed according to conditions in Table 3 and cured by various methods with and without post inflation

cord data into tires was found. Low-growth cords gave low-growth tires, and high-growth cords led to high tire growth.

The actual levels of growth were dependent on the manner of curing, and high-growth cords in a tire which was subjected to post inflation after curing gave a lower tire inflation growth than low-growth cords in a tire cured by a fast cycle without post inflation.

Summary and Conclusions

Multiple-step hot stretching of nylon cord was found to be an effective route to more efficient use of nylon cord in tires. By the use of nylon cord treated by a two-step process involving stretching followed by annealing at constant length, it was shown that the cord content per tire could be reduced 10% below that of tires in which unstretched cord was used (as evidenced by greater yards per pound for such cord), without sacrifice in carcass strength, and with a decrease in tire growth. A three-step process was demonstrated as a route to achieving further small decreases in the amount of cord used per tire.

Cord physical properties were found to be carried over into tire properties, but the degree to which this occurred was dependent on the method of tire curing and on the shrinkage properties of the cord.

Post inflation was shown to be effective in the elimination of tread concavity normally found when cords with high shrinkage were used together with fast, hot cures. Even when cords of low shrinkage were employed, post inflation led to reduced tire growth, with its attendant benefits.

While the specific cord processing and tire curing conditions utilized in the work here reported may not be strictly pertinent to all manufacturing conditions, it is felt that the principles developed can be applied to make better and lower-cost nylon tires.

Modified Urethane Foams

Experiments conducted jointly by National Aniline Division, Allied Chemical & Dye Corp., and Owens-Corning Fiberglas Corp., both of New York, N. Y., show that adding variously sized and coated glass fibers results in useful modifications of urethane foams. Resilience, compression set, and compressive strength may be noticeably increased, and % elongation reduced. Density of the finished foam is not affected when up to 5% (by weight) glass fiber is used; resistance to humidity aging and porosity are not affected at all. Tensile strength, in some cases, decreases slightly.

Principal components of the test foams were Nacconate 80 (isocyanate), Plaskon PFR-4 (polyester), and Fiberglas in several lengths, screen sizes, and binders.

Analysis of tests indicates that when one specific property of a foam is to be improved, a glass fiber of suitable length, coating, and percentage in the final formulation can generally be found. Changes in other physical characteristics, however, must also be checked to be certain they have not exceeded useful limits. Several examples of what can be accomplished follow.

For applications in cushioning, the "plateau" can be eliminated, and hysteresis loss reduced by adding 5% of ⅛-inch milled fiber. Simultaneously, compressive strength increases from 0.46 to 0.68 psi., helping to alleviate the problem of slow comeback.

When hysteresis losses are desirable, as in impact cushioning, they can be achieved by adding 5% of 1/32-inch milled fibers. Compression strength will be high, and % elongation low. The material offers sustained resistance and rebounds slowly, making it an excellent shock absorber. The same glass fiber may also be added to rug cushioning for a feeling of luxurious depth.

These findings are the results of a preliminary study on polyester type urethane foams only, but polyether-based urethane foams are currently under investigation.

New Method for Bonding Polyethylene To Rubber, Brass, and Brass-Plated Metals

By H. PETERS and W. H. LOCKWOOD
Bell Telephone Laboratories, Inc., Murray Hill, N. J.

A new bonding process, which utilizes partially hydrogenated polybutadiene, now makes possible the direct adhesion of polyethylene to rubber, brass, or brass-plated metals. The method produces bonds with tensile strengths up to 1,000 psi. and peel strengths from 60-100 pounds per inch.

This new bonding technique should prove useful in applications such as applying polyethylene insulation to wire and cable, the manufacture of printed circuit boards, submarine cable repeaters, coatings for tanks and plating racks, missiles, and also in bonding polyethylene uppers to shoe soles.

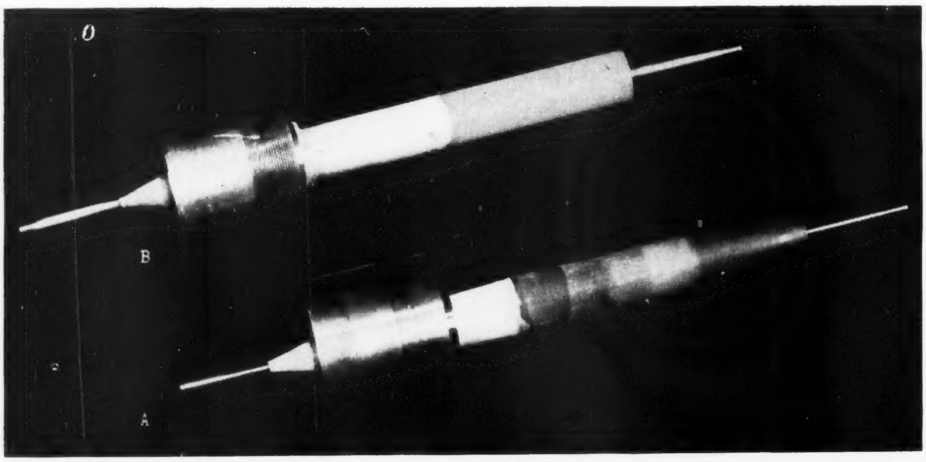


Fig. 1. Graded rubber-polyethylene submarine cable seal. Top (B) shows new direct rubber-polyethylene seal; bottom (A) is seal made previously through four intermediate layers of polyethylene-natural rubber mixtures of graded compositions

POLYETHYLENE, although widely used in both domestic and commercial applications, has been hindered from the full utilization because of the relative difficulty in joining it to other materials, particularly to rubber and metals. Tight seals and adequately strong bonding have not been possible through any currently available direct joining techniques.

It has been necessary, therefore, to resort to complex step-by-step procedures such as that used in the repeater housing for the undersea telephone cables laid in 1950, between Key West, Fla., and Havana, Cuba. These bonds, or graded seals,[1] required an initial bonding of vulcanizable rubber to a brass bushing, and then bonding the polyethylene insulation through four intermediate layers of polyethylene-natural rubber mixtures of graded compositions.

A new cement bonding process now makes it possible to bond polyethylene directly to a vulcanizable rubber, brass, or brass-plated metals, without going through graded compositions or vulcanizable rubber. (See Figure 1.) The cement is based on partially hydrogenated polybutadiene (8% unsaturation). This polymer is manufactured by the Phillips Petroleum Co., under the name Hydropol.[2] In use, the cement is compounded with vulcanizing ingredients and inserted between the materials to be bonded, as a thin film. Application of heat and pressure then produces a strong, vulcanized bond.[3] The layer of bonding material should be two or three mils thick for proper adhesion; this thickness can be built up from a solution, or a sheet can be fabricated for insertion between the materials to be bonded. Bonding is accomplished at temperatures ranging from 150 to 232° C., and at pressures of 100 psi. or less, although higher temperatures and pressures may be used if desirable.

Bonds are produced by this method with tensile

[1] H. Peters, United States patent No. 2,635,975 (Apr. 21, 1953).
[2] R. V. Jones, C. W. Moberly, W. B. Reynolds, *Ind. Eng. Chem.*, 45, 1117 (1953).
[3] Bonding by this technique is the subject of United States and foreign applications for patents.

strengths up to 1,000 psi., and peel strengths ranging from 60 to 100 pounds per inch.

Polybutadiene has the following approximate structure: . . . $CH_2—CH=CH—CH_2—(CH_2—CH=CH—CH_2)_x—CH_2$ . . . where x is a large number. This polymer is a rubbery material with little resemblance to polyethylene. As the material is hydrogenated, however, it becomes firmer, more waxy, and approaches polyethylene in properties and appearance, as more and more of the double bonds in the polymer become saturated. This similarity in structure makes it possible to heat-seal polybutadiene with 8% unsaturation with polyethylene.

Theory of Bond

The bond between partially hydrogenated polybutadiene and compositions of soft and hard rubber is believed to be formed primarily by vulcanization, involving the double bonds in both molecules. Even a small amount of unsaturation in partially hydrogenated polybutadiene suffices for a strong bond to vulcanizable rubbers. For instance, a satisfactory bond can be achieved with hydrogenated polybutadiene mixed with enough polyethylene to give a compound of only 3% unsaturation.

Bonding brass to rubber is an art which dates back almost to the discovery of vulcanization; a British patent was granted to C. Sanderson as early as 1862.[4] The brass plating method for obtaining adhesion between metals and rubber was developed by G. H. Hood[5] in 1911, but did not come into widespread use until 1925. Theories on this subject are numerous and conflicting, although there is general agreement on several variables important to the strength of adhesion. Some of these include composition of the rubber compound, vulcanization rates, and the composition of plating baths.

The bond which develops when rubber compounds are vulcanized in contact with brass apparently results from the chemical reaction between sulfur and rubber on the one hand and sulfur and the metal constituents of the alloy on the other. Not all rubber compounds give adhesion to brass, and the development of satisfactory formulations constitutes one of the most important problems associated with any bonding process.

[4]No. 3,288.
[5]India Rubber World, 44,374 (1911).
[6]I. D. Morron, *Ibid.*, 98, 4, 35 (1938).
[7]W. A. Gurney, *Trans. Inst. Rubber Ind.*, 18, 207 (1943).
[8]W. J. McCortney, *Vanderbilt News*, 3, 6, 8 (1933).

TABLE 1. POLYBUTADIENE BASE FORMULATION

Ingredients	Parts by Weight
Partly hydrogenated polybutadiene	100.0%
Zinc oxide	50.0
Petrolatum	5.0
Sulfur	3.0
Trimethyldihydroquinoline	1.0
Stearic acid	0.5
Mercaptobenzothiazole	0.5

Although all the ingredients in a formulation may contribute to the bonding, the real key lies in the curing system, i.e., sulfur and especially the accelerator. Several investigators have pointed out the necessity of using a moderate-speed accelerator so that the union of the sulfur with rubber and with brass proceeds simultaneously.[6-8] It should thus not proceed so fast as to favor the rubber, or so slow as to permit excessive reaction between the sulfur and brass, while movement of the still plastic rubber is possible. Mercaptobenzothiazole was chosen for these experiments as a medium-speed accelerator which would give best bonding of rubber to brass.

The same approach was applied to the compounding of partly hydrogenated polybutadiene, primarily formulated to obtain adhesion to brass. Obviously, many other compounds can be formulated for this purpose, but the basic formulation shown in Table 1 was used throughout this investigation. (The formulation produces an unsaturation value of 8%.)

Compounds were made on conventional mixing rolls. Although some sticking was observed, it could be minimized by keeping the rolls cool. The compound does not scorch during the mixing cycle and shelf-ages very well. Ten grams of the mill-mixed compound were dissolved in 100 cubic centimeters of toluene to prepare the cement. This procedure generally required 2-3 hours of heating, after which the cement would stay liquid for 4-5 hours at room temperature before gelling. Reheating disperses the gell. (This operation can be repeated many times without forming a permanent gell.)

The cement can be applied with a spray gun, by brush, or by dipping. Solvents other than toluene can be used; a suitable cement can be also achieved, starting with a dry powder mix of the Hydropol crumb plus compounding ingredients dispersed in a solvent.

Effects of Brass Composition

Success in bonding sulfur-vulcanizable rubbers directly to brass is a function of the copper-zinc ratio,

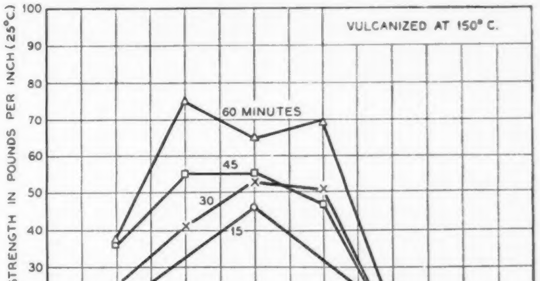
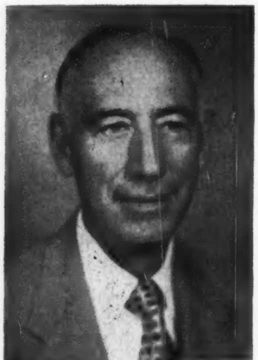


Fig. 2. Effect of copper-zinc content of brass on the peel strength of polyethylene bounded to it with hydrogenated polybutadiene of 8% unsaturation

H. J. Peters W. H. Lockwood

The Authors

H. J. Peters, head of the general rubber problems division, Bell Telephone Laboratories, Murray Hill, N. J., obtained a B.S. in chemistry from the Polytechnic Institute of Brooklyn in 1934. He has been employed by the Bell Telephone Laboratories since 1922.

Mr. Peters is a member of the American Chemical Society and its Division of Rubber Chemistry, the American Society for Testing Materials and its Committee D-11 on Rubber, the New York Rubber Group, and Toastmasters International.

W. H. Lockwood, technical aide at Bell Laboratories, studied chemical engineering at Newark Technical School. He has been at Bell Laboratories since 1934.

Mr. Lockwood is a member, junior grade, of the American Chemical Society.

a fact known to most rubber technologists. Experimental data shown in Figure 2 show that the maximum peel strengths of polyethylene strip bonded to brass also depend on the ratio between copper and zinc, and that maximum peel strengths are obtained with a brass having a 65/35-75/25 copper-zinc ratio. (It is possible that this range might shift slightly with a different sulfur-accelerator ratio.)

Appearance of the samples shown in Figure 3 is consistent with the data presented in Figure 2. Brass with a 70/30 composition produces the best adhesion, as judged by the peel strength and by the residual adhesive left on the surface of the brass and the polyethylene. Similar results were obtained with 65/35 and 75/25 brass, but are not illustrated.

While it may not be completely apparent in the illustration, the discoloration on the brass and the surface of the vulcanized adhesive is different for each composition. The 90/10 sample is black, and the 60/40 is almost free of any discoloration. The discoloration suggests the presence of cuprous or cupric sulfide or a mixture of both. This has been confirmed in part by Satake[9] and Buchan.[10]

It has not been firmly established, however, what sulfide or ratio of sulfides produces the best adhesion. Attempts are being made in our laboratories to obtain information on this question. Information to date indicates the presence of both sulfides along with a small amount of oxide. The oxide could exist as an impurity, or its presence might be significant to adhesion. If future work proves the presence of the oxide to be significant, it would lend considerable weight to the oxidation theory postulated by Blow.[11]

Following these determinations, all experiments were run using 3/4 hard brass with a composition of 64.41% copper and 35.47% zinc (no lead), 0.004-inch thick. The brass was degreased at 25° C. with toluene, abraided with fine #280-Aloxite[12] paper, and again cleaned with toluene.

Low density polyethylene was used throughout the investigation, although excellent results can also be obtained with high density compounds.

[9] *J. Rubber Ind., Japan,* 8, 461 (1935).
[10] S. Buchan, "Rubber to Metal Bonding," p. 161, Crosby Lockwood & Son, Ltd., London, England (1948).
[11] *India Rubber J.,* 111, 15, 522 (1946).
[12] Minnesota Mining & Mfg. Co., St. Paul, Minn.

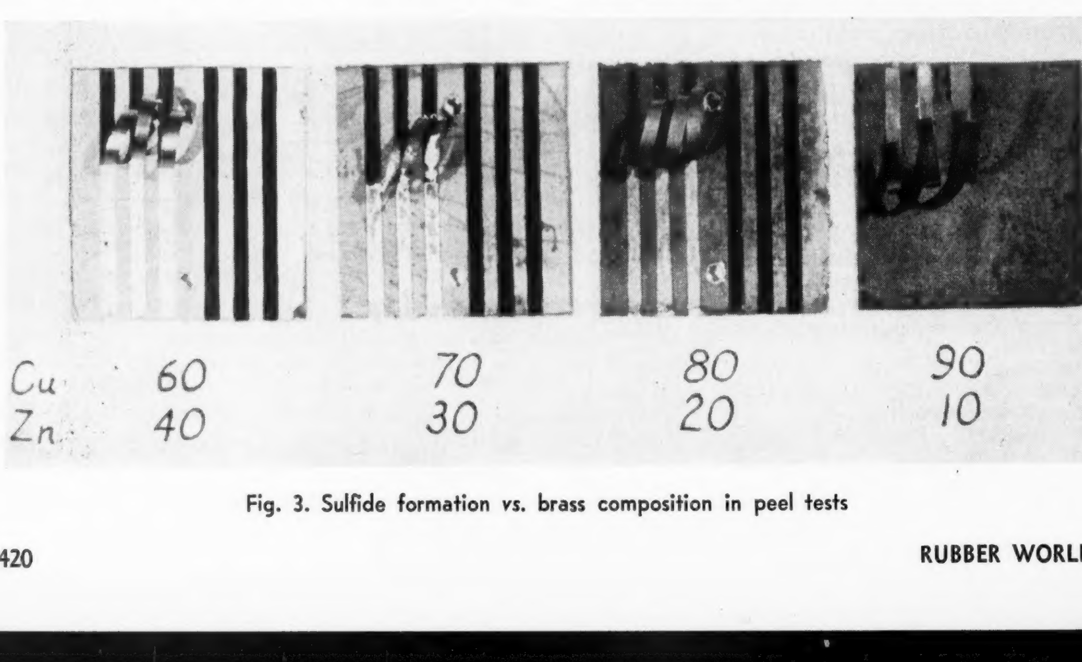


Fig. 3. Sulfide formation vs. brass composition in peel tests

Brass-to-Polyethylene Peel-Test Results

Brass sheet specimens, 2 by 2 inches by 0.004-inch, cleaned as described above, were sprayed with a warm solution of the unvulcanized, vulcanizable, partly hydrogenated polybutadiene. The thickness of the dried film was approximately 0.003-inch. This film was placed in contact with a preformed 0.060-inch sheet of polyethylene and vulcanized in a positive mold at 100 psi. for various periods of time, at various temperatures. The bonded laminate was then removed from the cooled mold.

Strips of adhesive tape 1/8-inch wide were spaced 1/8-inch apart on the surface of the laminate, and the exposed surface was treated with a masking agent. The tape strips were then removed, and the brass beneath was etched away with ferric chloride. After etching, the samples were aged at 25° C., 50% humidity, for three days, before testing.

The peel-test equipment is shown in Figure 4. The board is clamped in a special fixture anchored to the lower jaw of an Instron[13] machine. The edge of the brass strip fits into the upper jaw of the machine, after having been pried loose with a knife, and the jaws are separated at the rate of one inch per minute, at 25° C.

Experimental Results

The properties of the polybutadiene vulcanizates with various degrees of unsaturation are shown in Table 2. The physical properties, while somewhat erratic, show clearly that the maximum tensile strength is obtained with the least unsaturation, and the hardness and elongation decrease with increased unsaturation. The brittle point (ASTM D 746-55T)[14] for all the vulcanized polymers gave low values of less than —70° C.

The electrical properties of these vulcanized hydrocarbons are excellent. Test results obtained with 8% unsaturated material approach those of polyethylene itself, and these properties are stable at high humidities. This fact should make the material attractive for use as an adhesive for printed circuit boards.

Figure 5 shows the relation between the sulfur content of the polybutadiene and the peel strength of polyethylene-brass bonds. One part sulfur appears to be the minimum amount required to give maximum adhesion.

Figure 6 shows the effect of time and temperature of vulcanization on the peel strength of brass-polyethylene laminate, bonded with a vulcanized hydrogenated polybutadiene. It is generally recognized that vulcanization time can be approximately halved with a temperature rise of 10° C. Maximum adhesion is obtained in a period as short as one minute at 232° C., or 3-5 minutes at 204° C. Short cures at an elevated temperature are desirable for bonding polyethylene to wire and cable. Where maximum adhesion is not required, however, lower temperatures and corresponding periods of cure produce satisfactory results.

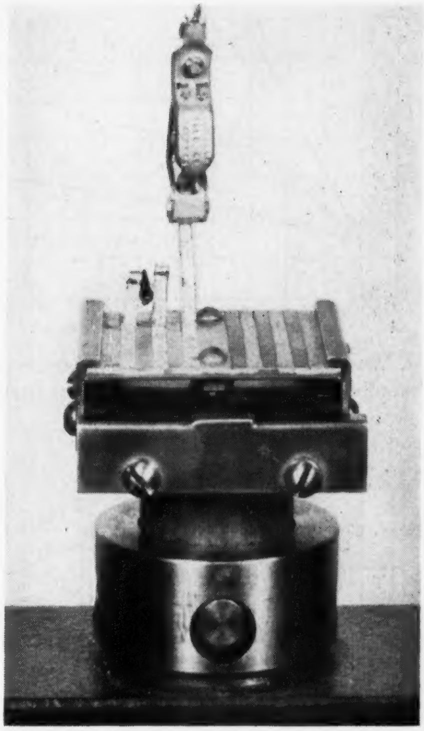


Fig. 4. Peel-test equipment for polyethylene-brass bonds

[13]Instron Engineering Corp., Quincy, Mass.
[14]American Society for Testing Materials, Philadelphia, Pa.

TABLE 2. PHYSICAL PROPERTIES *VS.* % UNSATURATION FOR HYDROGENATED POLYBUTADIENE VULCANIZATES

	8	18	29	55	64	88
Tensile strength, psi.*	3700	1310	1515	770	500	400
Elongation, %	750	425	400	400	380	490
Hardness, Shore A	90	90	81	62	60	44
300% Modulus, psi.	950	1150	1100	380	400	250
Brittle point, ° C.	<-70	<-70	<-70	<-70	<-70	<-70
Frequency, KC	1	1	—	—	—	1
Dielectric constant	2.65	3.13	—	—	—	2.96
Dissipation factor	0.0027	0.0100	—	—	—	0.0033
Volume resistivity (d. c.) ohm—cm.	$>1\times10^{16}$	$>1\times10^{16}$	—	—	—	$>1\times10^{16}$
Dielectric strength, 60 c.p.s.	1320	880	—	—	—	650

*Vulcanized 60 minutes at 150° C.

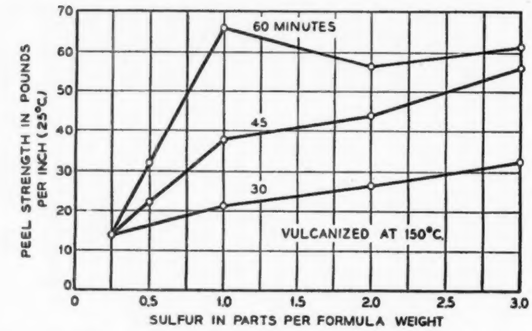


Fig. 5. Effect of sulfur content of 8% unsaturated polybutadiene bonding agent on the peel strength of polyethylene-brass laminate

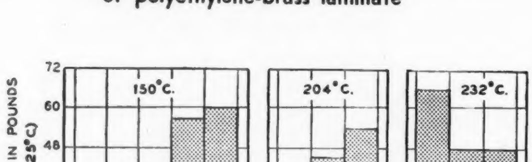


Fig. 6. Effect of time and temperature of vulcanization on peel strength of polyethylene-brass laminate

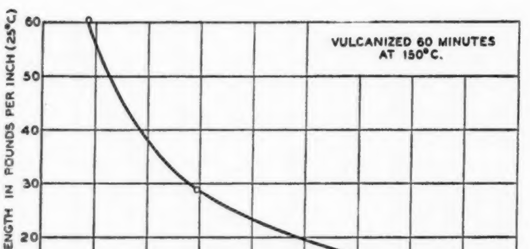


Fig. 7. Effect of unsaturation of polybutadiene bonding agent on peel strength of polyethylene-brass laminate

TABLE 3. EFFECT OF HEAT AGING ON THE PEEL STRENTH OF BRASS-POLYETHYLENE LAMINATE

Peel Strength (P.I.) at 25° C.

Aging Time-days	25	70	100
1	57	—	—
30	52	74	31
90	54	67	36

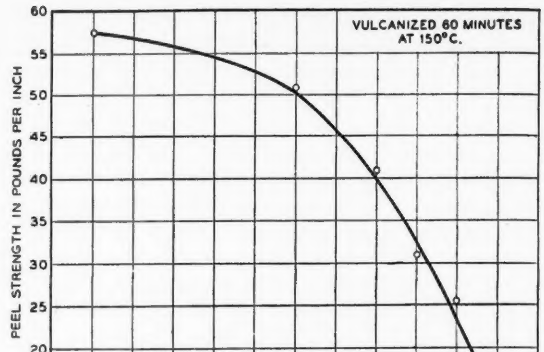


Fig. 8. Effect of test temperature on peel strength of polyethylene-brass laminate

Figure 7 illustrates the effect of unsaturation of the vulcanizable hydrogenated polybutadiene on the peel strength. As the unsaturation is reduced to 8%, increased adhesion is obtained between brass and polyethylene. On further reduction of the unsaturation to 3% (accomplished by mixing polyethylene with the 8% unsaturated polybutadiene), a satisfactory, but weaker bond is obtained. Compounded polyethylene with zero unsaturation has a peel strength of 4 p.i. With increasing unsaturation, the bond to brass remains strong, but the bond to polyethylene becomes weaker.

As shown in Figure 8, the peel strength of brass bonded to polyethylene decreases with an increase in temperature, falling off sharply at 50° C., and approaching a value of 15 p.i. at 75° C. This is still considered a respectable value for printed circuit boards and the like, considering the 6-8 p.i. value usually obtained in industry.

Bonded brass-polyethylene laminates were aged for various periods of time and temperature. Peel strength measurement was made at 25° C. The results, tabulated in Table 3, show that after three months' exposure to various temperatures, the peel strength remained relatively stable, with the exception of those exposed to 100° C. where some degradation of the bond strength was noted.

Rubber-to-Polyethylene Button-Test Results

Bonding natural rubber, styrene-butadiene rubber (SBR), nitrile rubber (NBR), and neoprene (CR) to polyethylene is accomplished in the same manner as bonding to brass. Because of tearing, peel tests are not feasible, but a button adhesion test, ASTM D 429-56T, was used as a means of evaluating bond strength in tension. (Occasional tearing of the rubber occurs in this test also.)

Figure 9 is a model of the test specimen used. It is laminated in this order: 70/30 brass, 0.04-inch disk of vulcanizable polybutadiene, 0.20-inch disk of polyethylene, 0.04-inch vulcanizable polybutadiene, 0.04-inch disk of a vulcanizable rubber, 0.04-inch disk of vulcanizable polybutadiene, and 70/30 brass. The en-

TABLE 4. RUBBER FORMULATIONS USED IN RUBBER-POLYETHYLENE BONDING

	Parts by Weight						
Ingredients	1	2	3	4	5	6	7
Natural rubber (NR)	100.0	100.0	100.0	100.0	—	—	—
Styrene-butadiene rubber (SBR)	—	—	—	—	100.0	—	—
Nitrile-butadiene rubber (NBR)	—	—	—	—	—	100.0	—
Neoprene (CR)	—	—	—	—	—	—	100.0
Magnesium oxide	—	—	—	—	—	—	4.0
Zinx oxide	200.0	50.0	5.0	—	5.0	5.0	5.0
Stearic acid	0.5	0.5	2.0	—	—	1.5	—
Petrolatum	5.0	5.0	—	—	—	—	—
Light process oil	—	—	—	—	15.0	—	—
Sulfur	3.0	3.0	3.0	32.0	2.0	1.5	2.0
2-Mercaptobenzothiazole	0.5	0.5	1.0	—	—	1.5	—
Benzothiazyldisulfide	—	—	—	—	0.4	—	—
Tetramethylthiuram Monosulfide	—	—	—	—	0.4	—	—
Accelerator 808*	—	—	—	1.0	—	—	—
Trimethyldihydroquinoline	1.0	1.0	—	—	—	—	—
S.R.F. black	—	—	50.0	—	50.0	—	—
F.T. black	—	—	—	—	—	50.0	50.0
Hard clay	—	—	—	85.0	—	—	—
Hard rubber dust	—	—	—	20.0	—	—	—
Adhesion (psi.)	950	700	1000	—	710	—	810

*Butyraldehyde-aniline condensation product, E. I. du Pont de Nemours & Co., Inc., elastomer chemicals department, Wilmington, Del.

tire sandwich is vulcanized, for one hour at 287° C. in a mold recommended by ASTM D 429-56T, and aged for three days before being tested.

This laminated structure makes it possible to determine the weakest link of the assembly. Usually the bond breaks between the rubber and the bonding agent, most often accompanied by material failure of the rubber, but occasionally as a clean break at the joining interface. Failure between polybutadiene (8% unsaturation) and polyethylene has never occurred.

The formulations selected for this investigation (Table 4) are typical and should not be considered selective. Other compounds should perform equally well. It is possible, however, that other fillers, plasticizers, and accelerators may have a pronounced effect on the degree of adhesion. Also, the rate of vulcanization may have a profound influence on bond strength. Vulcanizing agents other than sulfur produce satisfactory adhesion; for example, dicumyl peroxide has been found unusually good in this respect.

Some of the adhesion values in Table 4 approach 1,000 psi. It is believed that compounds with greater modulus and improved tear resistance would produce adhesion values in excess of 1,000 psi.

Hard natural rubber may be bonded to polyethylene by this process, and hard rubbers made from various synthetic elastomers should perform equally as well.

Summary and Conclusions

With this new bonding process, polyethylene can be bonded to brass, brass-plated metals, and natural rubber, SBR, NBR, and CR. The method produces bonds with tensile strengths up to 1,000 psi. and peel strengths from 60-100 pounds per inch.

Fig. 9. Test specimen used for rubber-polyethylene bond strength test (according to ASTM D 429-56T)

The process uses a partly hydrogenated polybutadiene called Hydropol made by Phillips Petroleum Co. Various ingredients are added to the Hydropol to make it capable of vulcanization; apparently it heat-seals to the polyethylene because of its similar chemical structure. The bond to a vulcanizable rubber is probably due to the formation of sulfur cross-links at the interface that occurs during vulcanization. Bonding to brass

(Continued on page 426)

Chemical-Loaded Molecular Sieves As Curing Aids

CHEMICAL-LOADED molecular sieves, a new product developed by Linde Co., division of Union Carbide Corp., have been found to be particularly useful as curing aids for not only silicone rubber, but also for natural, styrene-butadiene, neoprene, and nitrile rubbers. Chemical-loaded molecular sieves are a combination of Linde molecular sieves and curing aids, which are held within the pore structure of the sieves by strong adsorptive forces. The active compounds, when adsorbed on the molecular sieves, are effectively isolated from the rubber formulation during processing and storage, but at curing temperatures, which are generally higher than processing temperatures, the active compound is released to accelerate the curing reaction.

Molecular sieves, a class of adsorbents, are synthetic crystalline alumino-silicate materials, chemically similar to many natural clays and feldspars and belonging to a class of minerals known as zeolites. Zeolites undergo dehydration with little or no change in their crystal structure. The dehydrated crystals are interlaced with regularly spaced channels of molecular dimensions. This network of uniform pores comprises almost 50% of the total volume of crystals.

The empty cavities in activated molecular sieve crystals have a strong affinity for the water that has been driven off, and if no water is present, they will accept any material that can get into the cavity. Only those molecules that are small enough to pass through the pores of the crystal, however, can enter the cavities and be adsorbed on the interior surface. Various types of molecular sieves are available to adsorb both large and small compounds; polar compounds are adsorbed in preference to non-polar compounds.

A large number of different compounds, including amines and peroxides, have been loaded on molecular sieves and evaluated as latent curing aids for rubbers and plastics. These include latent secondary accelerators piperidine (CW-1015) and di-n-butylamine (CW-1115), latent neoprene accelerators catechol (CW-3010) and diethyl thiourea (CW-3120), and the latent curing aid di-tertiary butyl peroxide (CW-2015).

Silicone Rubber Curing

Early in 1956 the silicones division of Union Carbide Corp. introduced X-1960 Curing Compound, a white paste containing di-tertiary-butyl peroxide for use with the company's W-96 vinyl silicone rubber. It represented a new concept in handling this effective, but highly volatile curing agent. X-1960 was prepared by loading molecular sieves with 15 weight-per cent. DTBP and has made possible simplified curing of large masses of silicone rubber.

Large silicone rubber-covered rolls were made for use in the textile, plastics, and paper industries. In the molding of large parts, X-1960 allows a one-step post-cure in place of a long scheduled step cure. In molding gaskets, use of X-1960 not only assures the lowest possible compression set, but also minimizes fabrication problems such as scorching.

Table 1 shows the effectiveness of CW-2015 (the major ingredient of X-1960) in preventing catalyst evaporation during accelerated bin aging of silicone rubber compound K-1035 (a general-purpose, 50 durometer, Union Carbide compound).

Note that the liquid DTBP was completely lost in a period of two days; whereas essentially no loss of peroxide from the CW-2015 cured compound has occurred even after 14 days.

Neoprene Cures

Chemical-loaded molecular sieves allow the use of very active or volatile compounds since they can be held inactive at ambient or processing temperatures and then released almost 100% into the system during the curing operation. Fast cures are thus obtained without sacrificing processing safety.

For example, Figure 1 shows that in the absence of an accelerator a Neoprene Type W formulation has

TABLE 1. STORAGE LIFE K-1035 COMPOUND WITH CW-2015

			Mold Cured 20 Min. @ 340° F.			Postcured 24 Hrs. @ 480° F.				
									Compression Set	
Type	Concentration P/100 P. K-1035	Bin Aged (Days)	Tensile Psi.	Elong. %	Hardness Shore A	Tensile Psi.	Elong. %	Hardness Shore A	Weight Loss %	Set %
DTBP-liquid	0.6	0	940	310	43	980	210	51	7.5	14
DTBP-liquid	0.6	2		no cure						
CW-2015	3.1	0	990	300	44	1000	220	51	6.9	12
CW-2015	3.1	14	1080	320	45	1030	230	48	5.8	15

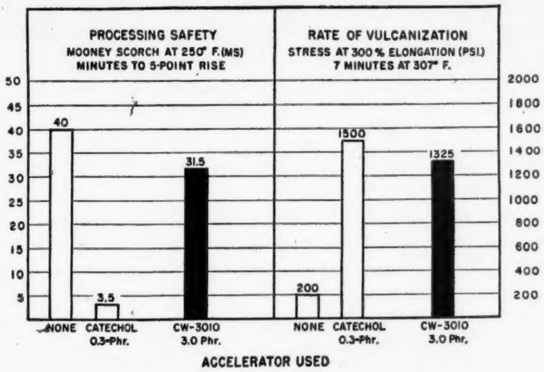


Fig. 1. Processing and vulcanization characteristics of Neoprene W compound cured with catechol-containing molecular sieve

good processing safety, as shown by a long Mooney scorch time at 250° F., and, of course, does not cure at 307° F. Catechol is a powerful accelerator for neoprene vulcanization. Figure 1 shows that when catechol is used, very good physical properties are obtained after curing seven minutes at 307° F. Because compounds containing this accelerator have such a short Mooney scorch time (3.5 minutes at 250° F.), however, processing is difficult if not almost impossible. The use of CW-3010 (catechol-loaded sieve) increased Mooney scorch time to 31.5 minutes and provided excellent physical properties when the formulation was cured seven minutes at 307° F.

Curing SBR Compounds

Loaded sieve secondary accelerators can be used with styrene-butadiene and other rubbers when the formulation must be adjusted to meet problems such as: (1) providing additional processing safety and an increased rate of cure; (2) providing a faster cure rate without further loss of processing safety; (3) maintaining the present cure rate and providing additional processing safety.

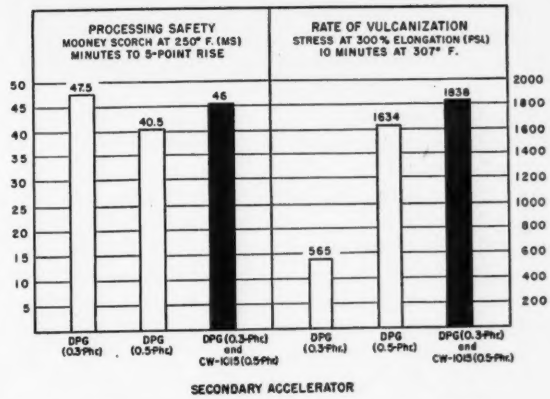


Fig. 3. SBR compound cured with DPG and CW-1015 as secondary accelerators shows good scorch time and improved cure rate

In the first instance, as shown in Figure 2, if a SBR tread recipe containing HAF black is accelerated with benzothiazyl disulfide, the scorch time is long enough without diphenyl guanidine as a secondary accelerator, but the state of cure after 10 minutes at 307° F. is unsatisfactory. The addition of the DPG reduces the scorch time by 4.5 minutes and provides a better, but not yet satisfactory state of cure in 10 minutes at 307° F.

If the CW-1015 piperidine containing sieve is substituted for the DPG, the scorch time is about equal to the recipe without the secondary accelerator, and the state of cure for the same time at 307° F. is more satisfactory.

Also, it is also shown in Figure 2 that if the formulation contains only a primary accelerator, CW-1015 may be added to give a substantial increase in rate of cure without shortening the scorch time.

It is possible to use loaded sieves in combination with other secondary accelerators. A SBR-HAF black compound containing both a primary accelerator, n-oxydiethylene benzothiazole sulfenamide, and a conventional secondary accelerator, DPG, has an increased rate of cure when CW-1015 is also added. (See Figure 3.)

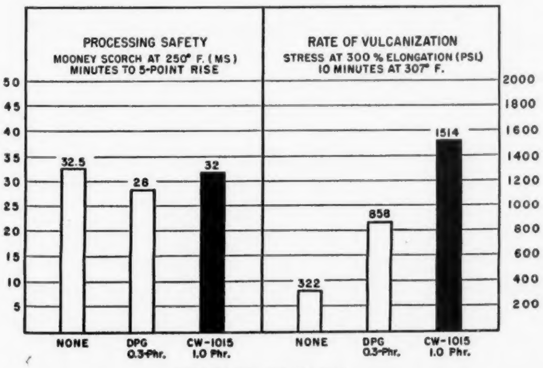


Fig. 2. SBR tread compound cured with piperidine-containing molecular sieve (CW-1015) as secondary accelerator as compared with DPG

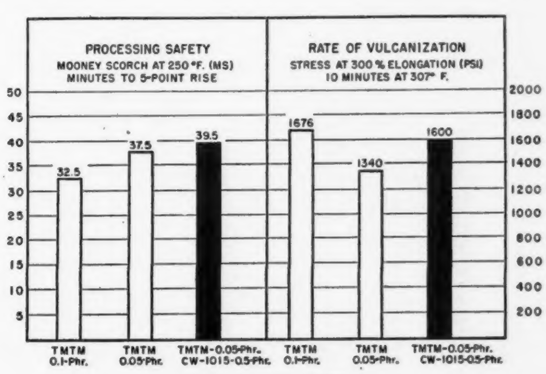


Fig. 4. SBR compound cured with TMTM and CW-1015 in order to provide a longer scorch time and a good cure rate

Increasing the concentration of the secondary accelerator alone, however, while increasing the rate of cure, also causes a definite increase in the Mooney scorch time.

Finally, another SBR-HAF black recipe using n-cyclohexyl benzothiazole sulfanamide as a primary accelerator and tetramethyl thiuram monosulfide as a secondary accelerator can be given an increased scorch time by decreasing the secondary accelerator, but the rate of cure also decreases. It is possible to add CW-1015 to this adjusted formulation, however, and to regain the cure rate obtained at the higher concentration of conventional secondary accelerator, while maintaining the improved processing safety with the lower concentration. (See Figure 4.)

General Comments

The technique of loading molecular sieves with compounds useful in accelerating vulcanization allows the use of materials previously considered of little commercial interest because they were too active for practical processing. In the adsorbed state volatility is decreased as are inflammability and toxicity due to greatly reduced vapor pressure.

The molecular sieve used to carry these active compounds is a fine powder having a particle size of about one to five microns. This inert material has essentially no effect during processing or after vulcanization on the properties of the formulations in which it is dispersed. The chemical-loaded sieve powder is free flowing and disperses readily in rubber formulations using standard mixing techniques.

The ability of molecular sieves to isolate the adsorbed active compound from the rubber system until it is released during vulcanization allows the use of varying concentrations of loaded sieves without affecting processing safety.

The temperature at which an adsorbed compound is released from molecular sieves is a function of its volatility. Low boiling materials are released at relatively low temperatures and will be useful in formulations which are processed and stored at low temperatures. Higher boiling materials, on the other hand, will be released at relatively high temperatures, and somewhat higher curing temperatures will be required for these compounds.

Chemical-loaded molecular sieves for the rubber and plastics industries will be distributed by Harwick Standard Chemical Co., Akron, O., with seven sales offices located in strategic areas in the United States.

Method for Bonding Polyethylene

(Continued from page 423)

is accomplished through the accepted theory of selective sulfiding of the metal.

A layer of bonding agent two to three mils thick is desirable for proper adhesion. The bonding agent may be dissolved in a solution and sprayed, brushed, or dipped to provide the desired layer, or a thin sheet can be fabricated and inserted between the materials to be bonded. Bonding is accomplished at temperatures from 150 to 232° C. and at pressures of 100 psi. or less, although higher temperatures and pressures may be used.

This new bonding technique should prove especially useful in applications such as applying polyethylene insulation to wire and cable, the manufacture of printed circuit boards, submarine cable repeaters, coatings for tanks and plating racks, missiles, and also in bonding polyethylene uppers to rubber soles in the shoe industry.

Properties of Skim Rubber

A review of the properties of skim rubber, a by-product of the natural rubber latex industry, is presented in the Spring, 1958, issue of "Rubber Developments," publication of the Natural Rubber Development Board, London, England, which is distributed in the United States by the Natural Rubber Bureau, Washington, D.C.

Skim rubber has an unfortunate reputation derived from the early days of the concentrated latex industry, due among other things to its variability and tendency to premature vulcanization. With increasing quantities of skim rubber now appearing on the market, a greater sense of responsibility has arisen among producers and the bulk of skim sheet and crepe is now produced and labeled as skim rubber.

The appearance of skim rubber is often a guide to its quality; the lighter colored crepe or sheet contains fewer non-rubber substances. The average of commercial samples contains about 80 to 85% rubber hydrocarbon.

By considerable reduction in the amount of accelerator, it is possible to bring the tensile and modulus properties in line with regular grades, but hardness remains above and resilience below normal, in pure gum compounds. Accelerated aging tests in air at 70° C. indicate that skim rubber in general has satisfactory aging properties.

On the open mill skim rubbers break down at about the same rate as regular grades, but power consumption is usually somewhat greater.

Advantages of skim rubber are its cleanliness, its value for blending with slower curing natural or synthetic rubbers, and the economies that may be realized in reducing accelerator content and maintaining the same cure rate as compared with regular grades. Skim rubber would appear to have processing advantages for high hardness compounds for extrusion and in soling compounds where the amount of reinforcing resins may be reduced because of the higher hardness properties of the skim rubber.

NEWS of the RUBBER WORLD

O'Sullivan-URW strike, now more than two years old, is contributing to stalemate in Congress on corrective labor legislation. May 16 order from National Labor Relations Board trial examiner for United Rubber Workers, AFL-CIO union, to discontinue picketing of Winchester, Va., plant and boycott of O'Sullivan products has made Senate and House Labor Committees' work more difficult.

United Rubber Workers union asked for wage talks with rubber industry management during May. Big Four companies countered by asking for a moratorium of a year on wage boosts because of the effect of the current recession on the industry. Union persists that wage boosts are essential to improving the economy.

National Science Foundation's Washington Conference on research and development emphasized that industry must do more in this field to help itself. Rubber industry expenditures at $82 million in 1956 fell about midway between the high and the low for 14 industry groups.

No reduction of natural rubber strategic stockpile seems likely this year as the Office of Defense Mobilization and other federal agencies continue their study of the Pettibone Special Stockpile Advisory Committee Report.

Skin temperatures of supersonic aircraft now and in the future (see front cover) emphasized at Rubber Division, ACS, symposium on "High-Temperature Resistant Elastomers" to underscore the steadily rising temperature requirements for elastomers for use in this field.

Columbia-Southern Chemical Corp. dedicates new research laboratory in Barberton, O. J. C. Warner, president of Carnegie Institute of Technology, challenged American schools to produce more and better scientists and engineers, in a dedication address.

American Viscose Corp. is converting all of its rayon tire yarn production facilities to "super super" 1100 denier type said to be 50% stronger than previous-type cords and to permit tires of greater carcass strength with lighter body weight.

MEETINGS

and REPORTS

Symposium, Goodyear Medalist Named At Cincinnati Rubber Division Meeting

The seventy-third meeting of the Division of Rubber Chemistry of the American Chemical Society, held at the Netherland Hilton Hotel in Cincinnati, O., May 14-16, attracted a very satisfactory attendance of 900 members and guests. This meeting, held separate from that of the parent Society, was featured by a symposium on "High Temperature Resistant Elastomers," on May 15, the tenth anniversary meeting of the Division's 25-Year Club, the announcement of the award of the Charles Goodyear Medal for 1958 to Joseph C. Patrick, and nominations for new officers and directors for 1959.

In addition, there were several amendments to the by-laws approved at this meeting by means of which an assistant treasurer, an assistant secretary, and another associate editor for *Rubber Chemistry and Technology* were appointed.

Another special feature was the showing of a motion picture, "High-Speed Photography in the Rubber Industry," prepared and explained by technical personnel of the Firestone Tire & Rubber Co.

R. F. Dunbrook, Firestone, chairman of the Division, presided at the first technical session on May 14, the business meeting on May 15, and at the banquet on the evening of May 15. E. H. Krismann, E. I. du Pont de Nemours & Co., Inc., Division vice chairman, presided at the May 16 luncheon-meeting of the liaison committee attended by directors and officers of the sponsored local rubber groups and officers and committee chairmen of the Division.

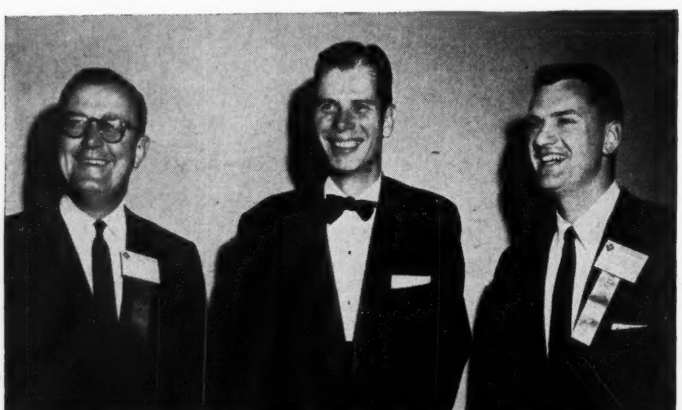
E. N. Cunningham, Precision Rubber Products Co., was chairman of the local committee on arrangements. He was assisted by J. R. Wall, Inland Mfg. Division, General Motors Corp.; F. W. Gage, Dayton Chemical Products Laboratories, Inc.; and J. M. Kelble, Wright Air Development Center, as vice chairmen, and Mr. Cunningham and his committee received many well-deserved congratulations for the success of the Cincinnati meeting.

25-Year Club Luncheon-Meeting

The tenth anniversary luncheon-meeting of the 25-Year Club of the Rubber Division was held on Wednesday noon, May 14, with H. S. Karch, C. P. Hall Co., as chairman. C. A. Merrill, Cincinnati's City Manager, was present as a guest of the Club and extended the city's welcome to those present and mentioned briefly some of the public works and highway improvement programs under way at the present time.

New members of the Club, who numbered about 10 at this meeting, were first asked to stand, after which a moment of silence was observed for those members who had passed on since the last meeting. These latter included R. L. Sibley, retired, formerly of Monsanto Chemical Co.; H. A. Morton, Rubber & Latex Products, Inc., Chemico, Inc., and Harrison-Morton Laboratories; T. Maxwell, Ohio State University; F. W. Frerichs, retired, formerly of Cupples Co.; G. G. Balazs, Goodyear Tire & Rubber Co.; and J. J. Catterall, The Rubber Manufacturers Association, Inc.

H. A. Winkelmann, Dryden Rubber Division, Sheller Mfg. Corp., conducted the contest for the member present with the record of the longest service in the industry who had not previously been honored in this manner. The contest was won by George Kratz, with 49 years of service, and he was given the usual memento of the occasion.



Local committee vice chairmen, left to right: J. R. Wall, Inland Mfg. Division; F. W. Gage, Dayton Chemical Products; and J. M. Kelble, Wright Air Development Center

High-Speed Photography

The motion picture on "High-Speed Photography in the Rubber Industry," presented during the morning and late afternoon of May 14, was explained by F. S. Conant, of Firestone. He emphasized that since most rubber products are black, and the frame and exposure time in the high-speed camera are extremely short, the problem is one of obtaining sufficient exposure. High-speed film and high light concentration on the subject are therefore essential. The amount of light necessary to expose rubber products correctly is normally sufficient to overexpose the auxiliary material in the field unless it is also dark colored.

The film itself showed examples of the "traction wave" developed by tires when operated at speeds of 100 miles per hour or more and of tires developed to reduce or eliminate the development of this phenomenon. Also, studies of tires going over cleats on an indoor test drum were shown in order to point out this means of evaluating tire riding comfort of various types of tires.

Other uses of high-speed photography in the rubber industry included in this film were calibration of a brittle point apparatus in which the striker arm velocity was measured, and determination of ultimate elongation of tire cord during the "guillotine" breaking test.

The Business Meeting

Chairman Dunbrook presided at the business meeting of the Division on

the morning of May 15. He first asked for a moment of silence in memory of those members whose deaths had occurred since the last meeting. These members were Henri Chauvin, Dominion Rubber Co., Ltd.; M. S. Kharasch, University of Chicago; M. H. Laatsch, Goodyear Tire & Rubber Co.; J. Q. McGiffin; R. L. Sibley, retired; F. W. Frerichs, retired; and A. J. Kearfott, General Motors Corp.

A report by K. Garvick, Mansfield Tire & Rubber Co., stated that at the end of 1957, the Division had 2,645 members and 531 associate members, while on May 12, 1958, there were 2,492 members and 574 associate members. A new membership drive is being planned by Mr. Garvick.

Amendments to the Division's bylaws were proposed and approved by the membership as follows: (1) Dues of members were increased from $4 to $5 a year and of associate members from $6.50 to $8 a year. A member shall automatically be awarded status as an emeritus member at age 65, shall enjoy all rights of membership without payment of dues, except that he shall not receive *Rubber Chemistry and Technology* nor the "Rubber Bibliography." (2) The business manager of *R C & T*, who handles Division funds, shall be bonded in amounts to be determined from time to time by the executive committee. (3) The title of "advertising manager" of *R C & T* is changed to that of "business manager." (4) An assistant secretary and an assistant treasurer shall be appointed to provide representation on the executive committee in the absence of the secretary and/or treasurer. (5) Additional nominations for officers and directors may be made by the membership provided these nominations are sponsored by at least 25 members.

(6) The price of *R C & T* to companies and libraries is increased to $9 per calendar year. (7) An editor and a board of up to four associate editors shall be appointed for *R C & T*, and there is to be both a business manager and an assistant business manager. (8) The vice chairman of the Division will appoint a member of the Division resident in the locality where Division meetings are held as chairman of the local committee on arrangements. (9) The Rubber Division Library shall be supervised by a committee consisting of five members of the Division, each to serve with staggered terms to permit one new member each year. This committee shall initiate a control policy as relating to Library functions, supervise and make up annual budget, check expenses, represent the Division in dealings with sources of income and with the University of Akron, and operate the Library according to the committee's stated policy. This committee is responsible to the Division executive committee.

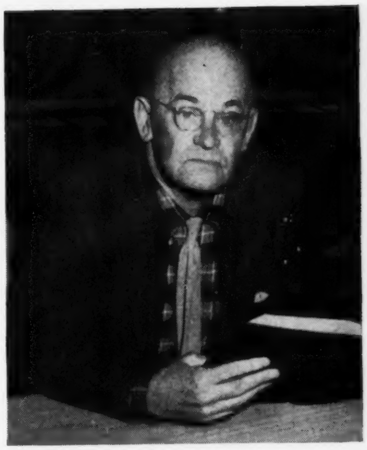
It was announced that L. H. Howland, Naugatuck Chemical Division, United States Rubber Co., had been appointed assistant secretary; D. F. Behney, Harwick Standard Chemical Co., had been appointed assistant treasurer; and B. L. Johnson, Firestone, had been appointed as one of the associate editors of *R C & T*.

J. M. Ball, Midwest Rubber Reclaiming Co., chairman of the nominating committee, reported the following candidates had been selected for officers and directors of the Division for 1959: chairman, E. H. Krismann; vice chairman, J. H. Ingmanson, Whitney Blake Co., and W. J. Sparks, Esso Research & Engineering Co.; secretary, R. H. Gerke, U. S. Rubber; and treasurer, George E. Popp, Phillips Chemical Co.

For directors from the areas of the local rubber groups: *Akron,* H. J. Niemeyer, Firestone, and S. C. Nicol, Goodyear; *Boston,* B. H. Capen, Tyer Rubber Co., and A. I. Ross, American Biltrite Rubber Co.; *Buffalo,* C. Schintzius, Hewitt-Robins, Inc., and E. F. Sverdrup, U. S. Rubber Reclaiming Co.; *Canada,* E. J. Buckler, Polymer Corp., Ltd., and O. R. Huggenberger, Dominion Rubber; *Chicago,* T. C. Argue, Roth Rubber Co., and H. D. Shetler, Chicago Rawhide Mfg. Co.; *Fort Wayne,* J. Dunne, United Carbon Co., Inc., and M. J. O'Connor, O'Connor & Co., Inc.; *Los Angeles,* C. E. Huxley, Enjay Co., Inc., and R. D. Sullivan, Shell Chemical Corp.; *New York,* W. M. Gall, Luzerne Rubber Co., and L. J. Radi, Interchemical Corp.

Patrick Goodyear Medalist

Joseph C. Patrick, discoverer and pioneer in the production of Thiokol oil-resistant synthetic rubber, has been selected to receive the 1958 Charles Goodyear Medal of the Division at the September meeting in Chicago, it was announced by B. S. Garvey, Jr., Pennsalt Chemicals, Inc., chairman of the medal award committee. The Charles Goodyear Medal, in commemoration of the discoverer of the vulcanization of rubber, is awarded annually to a person who has made a valuable contribution to the science or technology of rubber or related subjects.



Joseph C. Patrick, 1958 Charles Goodyear Medalist

Dr. Patrick developed the chemical methods of synthesis, control of quality, vulcanization, and processing of Thiokol polysulfide rubber. His work was carried out at the same time and before publication of the basic work of W. H. Carothers on polymerization. He was one of the founders of the Thiokol Chemical Corp. in 1929 and for 20 years was in charge of research and development work on this import-

Best Paper Award for September, 1957, meeting being made to Hugh C. Diem, B. F. Goodrich, by B. S. Garvey, Pennsalt Chemicals; E. H. Krismann, Du Pont, Division vice chairman on left

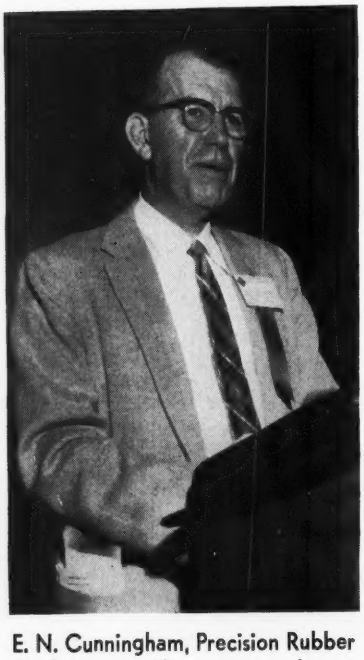
ant synthetic rubber, which has played increasingly prominent roles in modern building methods, industrial applications, aircraft construction, and in power plants for rockets and missiles. Since 1948 he has been a consultant to Thiokol Chemical Corp.

During World War II, Dr. Patrick directed the development of a liquid form of rubber which provided the gasoline tank sealer that made it possible for aircraft to store much more fuel than formerly. Later the Jet Propulsion Laboratory of the California Institute of Technology discovered that Thiokol synthetic rubber could be used as a rocket fuel and brought about the revolutionary development of the product for guided missiles and rocket motors.

Dr. Patrick was born in Jefferson City, Mo., in 1892. His education at the Kansas City College of Medicine & Surgery was interrupted by World War I and his service in France with the Army Medical Corps. After discharge from the Army, he worked as a chemist for Armour & Co. in the Argentine before completing his work for the medical degree. He never practiced medicine, but opened his own chemical research laboratory in Kansas City, and it was here that the discovery of Thiokol synthetic rubber was made.

High-Temperature Symposium and Other Sessions

The first technical session began on the afternoon of May 14 with Division Chairman R. F. Dunbrook presiding and welcoming the members and guests present. The symposium on "High-Temperature Resistant Elastomers," arranged by E. R. Bartholomew, of the Materials Laboratory of Wright Air Development Center, was held on May 15, with Mr. Bartholomew presiding at the first session and E. N. Cunningham, presiding at the second session. S. C. Nicol, presided at the final session on the morning of May 16, which dealt with papers on vulcanization and reinforcement. Abstracts of all of these papers were published in the April issue of RUBBER WORLD, beginning on page 91.



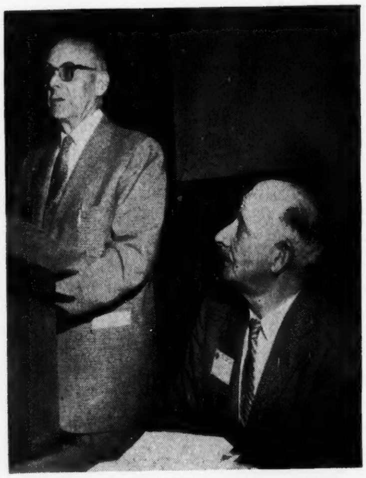
E. N. Cunningham, Precision Rubber Products, presiding at second symposium session on May 15

Papers at the first session dealt mostly with urethane rubbers and synthetic latices, with additional papers on testing and testing equipment. Adiprene L, a new liquid urethane rubber capable of being cast in molds, sprayed, or applied by dipping to produce a wide variety of mechanical goods and protective coatings, was described by R. J. Athey, du Pont. Vulcanization to a solid rubber can be accomplished in from five minutes to 24 hours, and products made from this rubber exhibit high tensile strength and resilience combined with excellent resistance to abrasion, compression set, oils, oxidation and ozone, and low temperatures.

A new ozone flex testing machine for evaluating rubber compounds under static and dynamic conditions was reported on in a paper by L. E. Carlson and R. S. Havenhill, of St. Joseph Lead Co. Results obtained with the new tester have shown good correlation with actual road tests on white sidewall tires in the Los Angeles area.

The influence of particle size on the viscosity of synthetic latex was discussed in two papers by P. H. Johnson and R. H. Kelsey, of Firestone. The viscosity of synthetic latex is favorably influenced by large particle size, and the large particles should constitute approximately 75% of the polymer mass, and the difference between large and small diameters should be great in order to obtain the most favorable viscosity, it was said. Also, from simple considerations of particle size and particle spacing a relation between particle size and limiting concentration was deduced.

In his opening remarks in connection with the symposium on "High-Temperature Resistant Elastomers," Mr. Bartholomew reviewed the Air Force requirements for elastomers for high-temperature service, with particular emphasis on the higher and higher temperatures involved as time goes on. A schematic illustration of a typical supersonic airplane was shown in which typical airframe skin temperatures for the present-day aircraft operating at three times the speed of sound at 50,000 feet of 500 to 650° F. were shown in comparison with those of future aircraft operating at seven times the speed of sound at 100,000 feet of



R. F. Dunbrook, Firestone, Division chairman, presiding at May 14 session, assisted by R. H. Gerke, U. S. Rubber, Division secretary

1200 to 2800° F. Although elastomer parts in such aircraft may not be exposed to temperatures quite so high as those of the surface of the aircraft, they may sometimes approach these temperatures quite closely.

Mr. Bartholomew emphasized, however, that in the last 10 years the percentage of increase in temperature at which elastomer materials are serviceable has been greater than for any other material of construction used in aircraft and missiles.

The first paper of the symposium, by F. F. M. Smith, of Firestone, presented some interesting information on the properties of 19 different elastomers at temperatures up to 550° F. It was indicated that, in general, the most useful elastomers at this temperature were the fluorocarbon rubbers.

The latest information on one of these fluorocarbon rubbers, Viton, was presented by W. V. Freed of Du Pont. The combined effect of heat and gamma radiation on practical rubber compounds for aircraft parts made of SBR, neoprene, nitrile and nitrile-polyvinyl chloride blends was described by J. W. Born and others of The B. F. Goodrich Co.

Vulcanization of butyl rubber with phenol formaldehyde derivatives to produce compounds with at least 100° F. higher service temperature was the subject of a paper by P. Viohl and others of U. S. Rubber. Although curing with phenolic resin requires longer than with sulfur, the phenolic resin-cured butyl rubber compound resists aging at 400° F. better than does the sulfur compound at 300° F.

Rubber can be bonded to metal to make jet and rocket parts that can withstand greater forces, higher temperatures, and tougher flying conditions than ever before, according to a paper presented by S. L. Brams and F. W.

Gage, of Dayton Chemical Products. Highly adequate resistance of the bond to exposures up to 96 hours at 400 and 450° F. has been observed both in synthetic lubricants and in hot air, it was said.

At the afternoon session of the symposium, a new halogenated butyl rubber, MD 551, said to be superior to regular butyl rubber in rate of cure, heat resistance, and dynamic properties, was described by L. T. Eby and J. V. Fusco, of Enjay Co., Inc. This new butyl is a "low unsaturation" polymer and has the inherent properties of the regular butyl, including superior air holding and ozone resistant properties. It is compatible with both natural rubber and SBR and may be vulcanized by several different curing systems.

Papers on silicone rubber for high-temperature service and dealing with the compression set and low-temperature properties of this rubber concluded the afternoon session on May 15.

At the final session on the morning of May 16, presided over by Mr. Nicol, an interesting paper on pore sizes and pore size distribution in reinforcing pigment particles was given by Andries Voet, of J. M. Huber Corp.

Gerard Kraus and R. L. Collins, of Phillips Petroleum Co., discussed odd electrons in rubber reinforcing carbon blacks. Rubber-grade carbon blacks contain appreciable concentrations of unpaired electrons which are reactive toward other free radicals as well as rubber. The reaction with rubber leads to points of attachment of the rubber by primary valence bonds and, as a result, should play a part in reinforcement, it was explained. This reaction does not appear to be the sole source of such attachments, however; nor can it be proved that such attachments are necessary for the development of the reinforcement effect, although they are thought to augment and improve it.

Other papers at this session included one on the temperature coefficient of vulcanization of butyl rubber by J. G. Martin and R. F. Neu, of Enjay, which provided information on proper curing times and temperatures for articles of any given size and shape; a paper on vulcanization of elastomers by electron beam irradiation by H. A. Winkelmann; and one on chemical loaded molecular sieves as latent curing aids, by F. M. O'Connor and others of Union Carbide Corp.

The Division Banquet

The banquet of the Rubber Division on the evening of May 15 was attended by about 475 members and guests. Dr. Dunbrook presided and after introducing the officers and directors seated at the head table paid special tribute to Mr. Cunningham and his local committee on arrangements for the success of the Cincinnati meeting. In accepting this tribute the local arrangements chairman expressed his special appreciation to his three vice chairmen, Messrs. Gage, Wall, and Kelble, as well as to the other hard-working members of his committee.

The presentation of the award for the best paper given at the September, 1957, meeting of the Division in New York, to C. F. Gibbs and Hugh E. Diem, of Goodrich, was made by Dr. Garvey. The award for the paper, entitled "Alkyllithium Polymerization of Isoprene," was accepted by Mr. Diem.

The banquet program was concluded with a fine program of variety acts.

E. R. Bartholomew, Wright Air Development Center, chairman of the "High-Temperature Elastomers" symposium presiding on the morning of May 15

Joint Meeting Hears Garvey

The International Meeting of the Buffalo and Ontario Rubber groups, held at the Sheraton-Brock Hotel, Niagara Falls, Ont., Canada, May 9, was attended by some 350 members and guests. Preceded by a suppliers' cocktail party in the Blue Room, provided through the courtesy of 87 American and Canadian firms, the dinner was held in the main dining room, with John Helwig, Dunlop Rubber Co., Buffalo, N. Y., and chairman of the Buffalo Rubber Group, presiding. Opening the meeting with the singing of the national anthems of both countries, he then introduced the following guests at the head table:

B. S. Garvey, Pennsalt Chemical Corp.; P. Sick, Hewitt-Robins, Inc., director, Rubber Division ACS; K. Cunliffe, Dunlop Canada, chairman, Rubber Division, CIC; Wray A. Cline, Canada General-Tower; G. Michael, general manager, CIC; C. Croakman, Columbian Carbon Canada, chairman-elect, ORG; J. Carr, Dunlop Canada, vice chairman, Rubber Division, CIC; R. R. Tartaglia, Goodrich Canada, vice chairman elect, ORG; and R. Herdlein, vice chairman, Buffalo Rubber Group.

Dr. Garvey, director, rubber sales and service laboratory, industrial division, Pennsalt Chemicals Corp., after being introduced by Mr. Helwig, chose as his subject, "The Changing Picture in Rubber Chemistry." In a most interesting address Dr. Garvey reviewed the changes that had taken place in the American and the Canadian rubber industry over the past 30 years. The types of rubber chemicals, equipment, and the products manufactured, as well as the science and practical art behind the compounding of the late 1920's were thoroughly reviewed and compared with the vastly increased numbers of varied polymers, accelerators, antioxidants and antiozonants, fillers, and other compounding ingredients available today. The ratio is roughly 10 actively used materials of any kind to one available 30 years ago.

The huge strides in polymer chemistry with the advent of the synthetic rubber industry were covered. The spread of available knowledge, theoretical and practical being brought even closer together, and circulated through the industry by government agencies, divisional meetings of the ACS, and local rubber groups, together with trade journals, was described. The steadily increasing need of the theoretical and research chemists to work more closely with the practical or production chemists was one of the great developments stressed by Dr. Garvey. The urgent necessity of a unified nomenclature system for the multitude of types and varieties of synthetic rubbers, similar to that now in use in the carbon black industry, was also discussed.

The speaker likewise covered the necessary characteristics for a technical man in the North American rubber industry of today, and the facilities available to technical personnel for study and information. These range from manufacturers' and suppliers' technical literature, papers presented at divisional and local meetings, trade journals, and divisional library facilities, to the interchange of information at meetings and conventions.

The forthcoming Rubber Division meeting as part of the CIC Conference at the Royal York Hotel in Toronto, Ont., May 28, was announced, with a standing invitation issued to the divisional meetings and luncheon to all present.

The Buffalo Rubber Group chairman announced its annual golf outing would be held at the Lancaster Country Club, June 10, and invited all present to attend.

Akron Group Panel on Natural Rubber

The Akron Rubber Group meeting of April 11 at the Sheraton-Mayflower Hotel in Akron, O., featured three speakers who discussed various aspects of natural rubber. S. J. Pike, of S. J. Pike Co. and T. A. Desmond Co., gave an interesting talk illustrated with many colored slides of the Far Eastern producing areas; D. J. Angier, The General Tire & Rubber Co., discussed chemistry and composition; and W. J. Sears, The Rubber Manufacturers Association, Inc., talked about the past, present, and future of natural rubber supplies, with special reference to yields and economics. Sherlock Holmes Evans, lawyer, novelist, speaker, entertained after dinner with a humorous commentary on life in these times.

Sheldon Nicol, Goodyear Tire & Rubber Co., Group chairman, presided at the dinner-meeting and first introduced those seated at the speaker's table, which in this instance included Alan J. Pickett, editor of the *Rubber and Plastics Age,* of London, England.

It was reported that the membership of the Group in March was at an all-time high of 1,822. In connection with the report of the scholarship committee, the four recipients of the Group's scholarships at Akron University were introduced.

Frank Wilcox, Witco Chemical Co., and C. E. Carlson, General Tire, were presented gifts by Mr. Nicol in appreciation for their work as moderators for the Group's educational courses.

The results of the election of officers was announced as follows: chairman, George Hackim, General Tire; vice chairman, Milton Leonard, Columbian Carbon Co.; secretary, I. J. Sjothun, Firestone Tire & Rubber Co.; and treasurer, John Gifford, Witco Chemical.

R. G. Knill, Goodyear, program chairman for the April 11 meeting, presided at the afternoon session and introduced the speakers.

Rubber Grading

Mr. Pike's talk covered the production, grading, and packaging of natural rubber and was somewhat in the form of a travelog. The more than 500 colored slides showed rubber and related activities in Hong Kong, Vietnam, Cambodia, Malaya, Singapore, Java, Sumatra, and Ceylon and brought out very clearly the wide geographical area of the rubber producing lands and the many different races of people that make up this vast industry.

The production of liquid latex and the various grades of dry rubber on both European and native estates was shown, together with the gathering of tree scrap, cup lump and cup washings, and plant clean-up—all of which latter are the basis for #2, #3, and #4 Brown Crepes.

Mr. Pike brought out the virtues of both European estate and native smallholder rubber and stressed particularly that there is a useful place for all of the types of rubber produced, irrespective of its origin, ownership or quality. His talk was similar to that presented before the Southern Rubber Group in November, 1957, and some further details may be found in our April, 1958, issue, page 110.

Rubber Chemistry

At the present time it would seem that natural and synthetic elastomers can live in harmony, at least until the economics of synthetic *cis*-polyisoprene become better known, Dr. Angier said.

He then reviewed the advantages of natural over synthetic rubber including its versatility, good all-around balance of properties, ease of processing, and ability to make products directly from latex with excellent gum strength. Natural rubber's main drawbacks, he added, are its price instability, relatively poor aging and oil resistance, and the varying quality of shipments. Some of these drawbacks and others are also found in synthetic rubbers, and no synthetic yet on the market has the same high-level balance of properties.

Typical composition of natural rubber and a comparison of smoked sheet and pale crepe were given, followed by an explanation of the configuration of the rubber molecule and its effect on physical properties.

There is a great deal of controversy as to where the sulfur links go during vulcanization, but there is more agreement that these bridges contain anything from one to eight sulfur atoms, it was said. Peroxide or irradiation cross-linking is effected by the removal of alpha-methylenic hydrogens from adjacent units in different chains, and subsequent combination to give a carbon-carbon cross-link.

If a mixture of purified natural rubber and a vinyl monomer is cold masticated in the absence of oxygen, the monomer grows on the ruptured ends, and a block polymer is formed. When a mixture of rubber and vinyl monomer is subjected to irradiation or is heated with certain peroxides, in the absence of oxygen, graft polymers result.

Dr. Angier also discussed thiol acid adducts, since thiol acids in very small amounts, reduce the crystallization of natural rubber at low temperatures, presumably by hindering alinement of the chains. He concluded with a description of the advantages of Superior Processing Rubber, which is made from partially prevulcanized latex, and of chlorinated, hydrochlorinated, cyclized and depolymerized natural rubber.

Rubber Supplies

Mr. Sears first presented statistics for natural and synthetic rubber world availability and demand for the period 1947-1966, as taken from his talk before the annual meeting of the RMA in November, 1957.[1] For the next several years, if these estimates prove reliable, there will be a potential supply of new rubber adequate to meet world demand, provided the free world increases its ratio of synthetic rubber use.

Regardless of what the future natural-synthetic rubber use ratio may be, natural rubber fills an extremely important requirement in the quality of some rubber products, Mr. Sears said, and then went on to review the location, organization, and operation of the natural rubber industry.

With reference to the cost of natural rubber, the speaker cited an American company in the plantation business as estimating production costs as high as 30¢ a pound on estates having only old, low-yielding type of rubber trees and 10¢ a pound for estates having the best available, high-yielding trees. Var-

[1] Rubber World, Dec., 1957, p. 426.

General Tire Photo

Akron Group speakers and R. G. Knill, program chairman (standing)

TABLE 1. ESTIMATED RUBBER SUPPLY-DEMAND, 1950-1980

(1,000 Long Tons)

Year	1950	1960	1970	1980
Natural rubber production	1860	1915	2500	2850
To Communists	188	271	436	702
Balance for free world	1672	1644	2064	2148
Free world natural synthetic consumption	2115	3781	4564	5548
Synthetic rubber required for free world	443	2137	2500	3400
Ratio synthetic/total, %	20.9	56.5	54.8	61.3

iation in yield during the life span of rubber trees of low- and high-yielding types was presented.

According to the so-called "Mudie Report" of 1954 on the rubber industry in Malaya, the only salvation for the Malayan rubber industry depends on a large and aggressively pursued replanting program, and data were presented to show how rubber production in Malaya might be affected by such a large replanting program.

Other means of increasing rubber output such as hormone application to the bark of rubber trees and "ladder tapping" were mentioned, and it was said that future Malayan output might be at an even higher level than estimated earlier; a production of 1.2 million tons a year by 1980 was suggested by one rubber goods manufacturer.

In conclusion, Mr. Sears made an estimate of possible rubber supply-demand relations through 1980 (Table 1).

The natural rubber industry has a clear opportunity to share in the increased market for total rubber only by increasing production by replanting or new planting and by lowering its production costs through planting only the highest-yielding rubber trees available.

The basic quality characteristics of natural rubber which are so important to the rubber goods manufacturing rubber today could be supplied in the future by the new synthetic natural rubber. If natural rubber supplies are not increased, the price of inadequate supplies would be bid up to a level that would stimulate and make commercially feasible the production of new synthetic rubber substitutes, Mr. Sears declared.

Detroit Hears Caprino Discuss Silicones

The April meeting of the Detroit Rubber & Plastics Group, Inc., was held at the Leland Hotel, Detroit, Mich. About 60 persons attended the predinner meeting at which Joseph C. Caprino, General Electric Co., Waterford, N. Y., spoke on "New Developments in Silicone Technology." At the dinner, attended by some 100 persons, M. A. Schoenbeck, elastomers laboratory, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., spoke on "Liquid Curing Media."[1]

In general, Mr. Caprino reviewed the developments in silicone rubber since 1954, with the very rapid progress made in this short period contrasted to the slow pace of development during the previous ten years, the first decade of the silicone rubber business. In illustrating the accelerating development of product technology, he said that scores of new compounds of many different kinds are coming in ever-increasing numbers from the major producers. Also, basic gum production is growing rapidly: in 1954 only three gums were available from one supplier—now nearly two dozen are being sold by three producers.

Major improvements in physical properties have also been made, he continued. These include higher strength—now double the 900 psi. common four years ago; oil and fuel resistance greatly improved over 1954 standards; and electrical conductivity now possible when desired. Also improved are high-temperature performance, compression and permanent set properties, and flame resistance.

Some processing improvements and innovations which Mr. Caprino pointed out include: development of hot air vulcanization technique; reinforced gums; development of room-temperature vulcanizing compounds; compounds which are fusible after curing; elimination of toxic additives once necessary to produce low compression set. Other improvements are the creation of silicone compounds with the same shrinkage as organic rubbers and the development, on a commercial scale, of reclaiming of silicone rubber.

Concerning specifications, he mentioned there were 11 new AMS specifications, 11 new military specifications issued and many others revised, four new grades of ASTM specifications, and innumerable industrial specifications developed.

Also briefly touched on was the steady decline in prices of silicone gums and compounds—a trend to which only a very few highly specialized silicone elastomers are exceptions.

In addition, the growth and the development of text methods and techniques needed for proper study of the unusual attributes of silicone rubber were reviewed.

At the meeting it was announced that the annual golf outing of the Group would be held on June 27 at Western Golf & Country Club, with special events and prizes, followed by a dinner meeting.

[1] See RUBBER WORLD, Apr., 1958, p. 81.

Boston Elastomer Group Has Tenth Anniversary

The tenth anniversary meeting of the Elastomer & Plastics Group, Northeastern Section, ACS, was held on May 20 at Science Park, Charles River Dam, Boston, Mass., with 60 members and guests present. It was the final meeting of the season, and the speaker for the evening was R. G. Seaman, editor, RUBBER WORLD, who discussed "The Future of Commercial Synthetic Rubbers."

A special program, presided over by E. Elmer Ross, T. C. Ashley Co., commemorated the establishment of the Group on October 24, 1948, at the Massachusetts Institute of Technology, with Howard Reynolds, Cryovac Division, W. R. Grace Co., second chairman of the Group and present chairman of the Northeastern Section, presenting a biographical sketch of the late Ernst A. Hauser, the Group's founder and first chairman. All but two of the past chairmen of the Group were present and at the head table, to share the birthday cake with those also present.

In his talk, which was largely factual, Mr. Seaman discussed the various synthetic and natural rubber production and consumption estimates most recently made by producers and consumers alike, which extended through 1965. Without the construction of any appreciable amount of new synthetic rubber production facilities in this country in the next seven years, it appears that natural and synthetic rubber supplies will be adequate until about 1965.

Recent surveys conducted to evaluate the adequacy of present synthetic rubber types in use were summarized and substantiated by statements and forecasts made by responsible officials of the producing companies. Mr. Seaman described some of the new polymers that are expected to become available in the near future, covering SBR, neoprene, nitrile, butyl, and silicone elastomers, and summarized the future of elastomers with one word—"good."

The next meeting of the Group, the annual meeting, will be held on October 21, at Science Park, and will include the election of officers. The speaker for the evening will be M. E. Lerner, editor, *Rubber Age*.

Tlargi Hears Sullivan, Sagenkahn, and Hoffman

The Los Angeles Rubber Group, Inc., held a technical dinner-meeting at the Biltmore Hotel, Los Angeles, Calif., April 1. The technical session was attended by 95 guests and members, who heard M. L. Sagenkahn and R. D. Sullivan, Shell Chemical Corp., Torrance, Calif., speak on "Disperser Black Masterbatches." At the dinner 240 members and guests heard S. Bowlby, vice president, Shell Oil Co., give an excellent description of the oil exploration business in the United States. Both talks are summarized below.

New members of Tlargi announced at the meeting include J. D. Esterly, and C. P. Connor, both of The Firestone Tire & Rubber Co., and M. Golland, Molded Rubber Specialties Co. The membership voted a return engagement to Las Vegas for the summer outing to be held on June 6-8.

Bowlby Discusses Oil Industry

Mr. Bowlby's speech was entitled, "Any Number Can Play." Conditions essential to the discovery of oil, he stated, include: (1) locate a marine sedimentary basin, (2) a type of reservoir rock or porous sandstone, and (3) a structure which permits oil and gas to accumulate above the water. It must be remembered that eight out of nine exploratory wells of "wildcats" are dry holes.

Since 1931 seismic exploration has been used to good advantage in discovering oil properties, he said. It is expensive, but is also more certain. United States is one of the very few nations in which mineral rights are transferred with the surface ownership of the land.

The U. S. needs oil to make products and needs land in the right place to obtain the oil. A reduction in the price of petroleum products does not necessarily increase the consumption, which is a different situation than may be obtained in many other businesses.

In California, 91% of the energy is supplied by petroleum. By 1975 with a population of 24 million people, Californians will have $63 billion to spend and will need 1,800,000 barrels of oil per day. The U. S. consumption of oil is 2½ barrels per day for every man, woman, and child. Petrochemical accounts for 50% of the chemicals used by man, and at present oil is second to water and air in the volume required by man. In the oil business, competition does not keep the price down, but it does keep the quality up.

Dispersed Black Masterbatches

M. L. Sagenkahn and R. D. Sullivan spoke on "Disperser Black Masterbatches." The latex-black masterbatch from the synthetic rubber plant, they said, provides savings to the processor in materials handling and in mixing requirements, as well as permits a cleaner plant operation. Industry acceptance of these masterbatches, however, has never been widespread, accounting for a maximum of 14% of the synthetic rubber consumption in the United States in recent years.

Pilot-plant evaluations have been made of a new process designed to overcome the deficiencies of the conventional latex-black masterbatching procedure. The new process incorporates a disperser device for the continuous preparations of slurries of finely divided carbon blacks in the absence of chemicals or dispersing agents.

A series of masterbatches of a common type from the disperser process has been compared with those from the conventional latex-black process, and from dry mixing. Single lots of latex, carbon black, and processing oil were employed in the preparation of the test materials. Factory mixing trials have shown that when the small amount of processing oil normally added in compounding is included in the latex-black masterbatch as softener, a typical first-line passenger tread stock can be compounded with about one-half the mixing time required when starting with clear polymer and loose black. Road wear tests have shown the disperser masterbatch process to provide tread compounds comparable in abrasion resistance to similar compounds from dry mixing and superior to those from the conventional latex-black masterbatch process.

A continuing program of investigation includes the evaluation of other process alternates and masterbatch compositions, variations in factory processing, and additional road wear trials.

Stoddard and Hoffman Talks

Tlargi held another dinner-meeting at the Biltmore Hotel, on May 6. At the technical session 55 members and guests heard A. E. Hoffman, Universal Oil Products Co., Des Plaines, Ill., speaking on "Control of Ozone Cracking in Rubber Goods." At the dinner session, sponsored by Stauffer Chemical Co., New York, N. Y., 240 members and guests heard Alexander J. Stoddard, with The Fund for the Advancement of Education, speak on "Schools to Match These Times."

Dr. Stoddard was introduced by C. Lindsay, vice president and general manager of Stauffer Chemical Co. Dr. Stoddard stated that the biggest business of our country was public education and that some $9-11 billion are spent per year on education in the United States. The U. S. differs from the rest of the world in being first in public education. In other countries higher education and, in some cases, any education depend upon wealth, social position, or birth. Here our program is to give every one an opportunity to get a certain amount of education and as a result to enable them ultimately to find their own level of life.

The trouble with the school system here, he said, is not due to Sputnik, but due to the inherent education philosophy under which the United States has lived for its lifetime, and, furthermore, the population of the U. S. is only 45 years ahead of schedule since we now have a population which we were predicted to have in the year 2000.

This has resulted in a shortage of good teachers. Since life is changing more rapidly and becoming more complicated, the problem is even greater than we would like to believe.

Fifty years ago the average adult had had four years of schooling; today the average adult has had eleven years of schooling and needs this much to cope with the complex problems of the present-day life here in the United States.

It has been said that civilization is a race between ignorance and education, and in this country today there are so many more people to be educated and so much more to be learned just to live since life has become that much more complex. Since the U. S. situation is that education here is a prerequisite of citizenship and not of wealth or social position, the schools can be no better than the people. Therefore all groups should pull together to make our schools fit to do the job ahead of them, he concluded.

Control of Ozone Cracking

Mr. Hoffman, at the technical session, reported that much of the cracking occurring in rubber goods is caused by reaction of ozone on stressed rubber vulcanizates. Protection for rubber vulcanizates against ozone attack may be provided by either physical barriers such as wax or by competing chemical reactions. UOP search for chemical antiozonants is guided by these requirements: antiozonant effectiveness; freedom from toxicity and skin irritating properties; availability in quantity; reasonable cost; non-staining and non-discoloring; migrating characteristics; unreactive with formulae ingredients; good physical properties; and effectiveness in all susceptible polymers.

The materials that most closely meet these requirements are substituted p-phenylene diamines, such as UOP 88 and 288. In order to obtain maximum ozone protection, Hoffman remarked, it is essential to recognize that these materials are reactive, basic compounds. For maximum protection, therefore, thiazole-type accelerators, furnace-type blacks, and, generally, non-acidic ingredients should be used in the formula. Effectiveness of antiozonants varies in different polymers.

Exposure conditions that affect cracking in vulcanizates are ozone concentration, temperature, amount of stress, and dynamic or static test conditions. In addition, rubber goods should be manufactured to minimize internal stresses or sharp edges where cracking will most likely initiate.

At the meeting R. N. Phelan, past chairman of Tlargi (1956), presented the Honorary Life Membership to R. E. Vivian, who has guided the development of the Tlargi Rubber Technology Foundation since its beginning in 1953. Also present at this meeting were six of the Honorary Life Members of the eleven who have been elected to this signal honor.

The new officers of the Chicago Rubber Group for 1958-59 are M. J. O'Connor, O'Connor & Co., president; J. Groot, Dryden Rubber Division, Sheller Mfg. Corp., vice president; S. F. Choate, Tumpeer Chemical Co., secretary; and H. C. Crosland, Chicago Rawhide Mfg. Co., treasurer. Board of directors are: manufacturers—J. C. Toman, Victor Mfg. & Gasket Co., and C. J. Woods, Dryden Rubber; suppliers—E. Minnerly, Jr., B. F. Goodrich Chemical Co., and F. P. Steitz, J. M. Huber Corp.

Morton Discusses Science and Education

At a dinner-meeting held by the Chicago Rubber Group, Inc., April 25, attended by some 240 members and guests, Maurice Morton, University of Akron, Akron, O., chose as his subject, "Science, Education, and Survival." A summary of his speech appears below. Announcement of results of election of officers of the Group for 1958-59 was made. Also diplomas, in recognition of graduation from the Group's course in basic rubber technology, were given to the 41 persons who completed the course.

Dr. Morton stated that the recent scientific successes achieved by the USSR have made a deep impression in this country and have led to widespread discussion of our own scientific and educational efforts and achievements. Although the "great debate" concerning educational methods and philosophies is still raging, it might be a good idea, at all times, to be aware of as many facts as possible concerning the status of the United States and the USSR. The accompanying tables (1-3), he said, should help place in proper perspective the status of these two leading countries and lead to a better understanding of the present situation.

Table 1. Technology in U.S. and USSR (1956)

	U.S.	USSR
Population (million)	170	200
Gross national product (billion)	$425	*$150
Personal income (billion)	$325	$100
Per capita	$1,800	$500
Defense budget (billion)	$38 (9%)	$40 (27%)
Steel production (million tons)	130	45
Motor vehicles (million)	7-9	0.5

*Four rubles/dollar.

The tables, said Dr. Morton, are practically self-explanatory. It is obvious that the Soviet Union, although still considerably behind us in industrial production and living standards, is progressing at a very rapid pace in education, and especially in the scientific fields.

To quote Ewell "Russia is using education as an instrument of national policy far beyond any other nation in history."

For instance, it should be noted that 90% of all Russian college students are completely subsidized by the government. Thus the USSR spent, in 1957, six billion rubles on college scholarships. We would have to spend at least $2-3 billion per year to compare with this figure.

Although we have made great progress in extending mass education even through the secondary school level, this has admittedly been accomplished with some sacrifice of standards. The Russians, on the other hand, have apparently maintained the high standards of European education, but spread their higher education at a somewhat slower pace.

Table 3, showing "Occupational Rewards," is also very revealing in that it shows the tremendous incentives which the USSR offers its citizens who qualify for scientific research and teaching. Undoubtedly, the science professor is among the elite in Russian society.

The Soviet leadership can, of course, claim that their progress is due to the superiority of their "planned society." We must accept that challenge, concluded Dr. Morton, and show that a free people can do a better job in providing quality education and in encouraging more scientific research. This is everyone's responsibility.

Plan Electrical Insulation Conference

The First National Conference on the Application of Electrical Insulation, with the participation of manufacturers, distributors, and users, will meet at Cleveland, O., September 3-5. This will be the first meeting of its kind ever held in the United States, attracting everybody either directly or indirectly interested in electrical insulation, both for military and civilian purposes. Attendance of between 1,500 and 2,000 is anticipated.

The conference is cosponsored by the American Institute of Electrical Engineers (AIEE) and the National Electrical Manufacturers Association (NEMA). The purpose is to provide a meeting ground for the maker and the user of electrical insulation where there can be a mutual interchange of practical technical information on a formal and informal basis, thereby leading to better utilization of existing materials, to better direction in the development of new materials, and to better methods of interchanging information.

Technical papers to be delivered will cover a wide variety of subjects in the field of electrical insulation and the application of insulating materials. Activities at Cleveland will include technical sessions, a commerical trade show, and technical exhibits. Further information can be obtained from T. F. Hart, Silicones Division, Union Carbide Corp., 30 E. 42nd St., New York 17, N. Y., who is the publicity chairman of the conference.

Table 2. Education in U. S. and USSR

	U. S.	USSR
Total spending (1957—million $)	130 (4%)	80 (8%)
Scientists and engineers		
In 1930	261,000	70,000
1952	760,000	890,000
1957 Graduates in science	26,000	11,760
In engineering	31,200	72,360
Non-technical graduates	248,000	136,000
Total college enrollments (1957)	3 million	*2 million
Freshmen	1 million	†428,000

* Five-year course
† Two-million applications

Table 3. Occupational Rewards in U. S. and USSR

	Monthly Income	
	U. S., $	USSR, Rubles
Unskilled labor	300	400
Production labor	500	1,000
B.S. technical (start)	450	1,200
School teacher	300-400	1,000 (start)
Ph.D. in science or engineering		
Industrial job (start)	650	1,200
Research or teaching (institutes and universities)	400-1,000	5,000-20,000

SAE-ASTM Technical Committee Meets

The SAE-ASTM Technical Committe on Automotive Rubber met on March 11-12 in Detroit, Mich., and transacted the business summarized below.

ISO Table Rejected

The Technical Committee voted against the latest International Standards Organization proposal (ISO-TC-45) for a single document which would contain all international rubber classifications. The vote, requested to guide the American delegate, R. D. Stiehler, National Bureau of Standards, was submitted on the following grounds: (1) it promotes specifying impossible combinations of properties; (2) it fails to give the consumer guidance on properties and elastomeric compositions that are commercially available; and (3) it is more cumbersome and difficult to use than the United States tabular system.

U.S.A. Compound Table

The proposed expanded tabular system which combines existing SAE 10R and ASTM D 735 tables into a single specification is now available in draft form from Technical Committee A Sub-Section Chairman T. M. Loring, Chicago Rawhide Mfg. Co., Chicago, Ill. The new specification consists of two tables: one combines all current basic tables, the other all current suffix tables. For the most part, existing values for each class of compound are retained.

This new system offers a more flexible way to incorporate new polymers and polymer blends. In addition, Tech A members feel it may be the start of an era when the customer can indicate more closely his actual needs.

Tests with H. A. Fuels

Only high aromatic fuels will be used in future Tech A studies of fuel-rubber compatibility. Because preliminary tests show that high aromatic fuels have a more significant effect on rubber hardness, tensile strength, and volume change, the committee has decided to limit future testing to fuels having a 50% or above aromatic content.

Two rubber compounds from Class SB and two from Class SC of the SAE-ASTM tables are being tested with two different fuels having the following content:

	Fuel One	Fuel Two
Iso-octane, %	50	50
Benzene, %	—	10
Toluene, %	50	20
Xylene, %	—	20

Set Test Time Reduction

An analysis of recent data on SAE 415, 515, 615, 715, and 815 compounds indicates the practicality of shortening the current test time from 70 to 22 hours. This would apply to Classes SB and SC for both basic and suffix B requirements. The compression set test on Class SC compounds which now runs for 22 hours at 158° F. will be changed to 22 hours at 212° F.

Impact Test Equipment

Ideally, impact test equipment should be small, compact, inexpensive, and designed to measure durability of a small rubber specimen subjected to repeated impacts. A set of broad specifications based on these considerations has been prepared by a Tech A subsection now working on a schematic drawing of suggested equipment.

Washington RG Program On Solid Polyurethanes

The Washington Rubber Group held its final meeting of the year (1957-58) at Pepco Auditorium, Washington, D. C., May 21. D. K. Bonn, president, announced the results of the election of officers for the coming year (1958-59) as follows: R. D. Stiehler, National Bureau of Standards, president; A. W. Sloan, Atlantic Research Corp., vice president; F. L. Shew, U. S. Navy, Bureau of Ships, secretary; and J. R. Britt, The B. F. Goodrich Co., treasurer.

A panel discussion on the uses of solid polyurethanes followed, with M. A. Smook, division head of elastomers laboratory, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., discussing urethane tires and wheels, and A. L. Rodde, manager of Vibrathane sales of Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn., speaking on polyurethane elastomers for mechanical goods.

Dr. Smook stated that most tire work centered around the use of solid millable urethanes; two of the initial candidates are Adiprene B[1] and Chemigum SL,[2] both of which depended on a diisocynate for vulcanization, which system proved scorchy and difficult to handle. Then Adiprene C[1] was developed, and it proved to be a substantial improvement in urethane tire technology as it was the first sulfur vulcanizable polyurethane.

In the initial development work, several hundred composite tires have been made having conventional SBR carcass and sidewalls and Adiprene C treads. The wear performance was spectacular, said Dr. Smook, and braking efficiency and traction on ice were about equivalent to those of SBR.

[1] E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

[2] Goodyear Tire & Rubber Co., chemical division, Akron, O.

The major problems to overcome are in processing. A really good plasticizer is needed to reduce the uncured stiffness and to simplify tire building, as well as an economical and practical method of building and adhering the components of a composite tire, and a better compounding control of modulus to assure balance throughout the tire.

Considerable success has been met in the use of the urethanes in solid wheels and tires where there are much less exacting requirements to fulfill.

Mr. Rodde pointed out that the success of millable and liquid polymers in mechanical goods, as well as in transportation items, footwear, and other products, has been pronounced. Outstanding abrasion resistance, dry heat stability, resistance to oxygen and ozone have been found in the application of the Vibrathane compounds in such products as conveyor belting, traction cleats, and roll covers.

Announcement was made of the annual Washington Rubber Group outing to be held at Bethesda, Md., Country Club on June 27. The golf tournament will be the feature of the outing, according to T. Tharp, general chairman.

Reveal Deuterio Rubber At DKG Conference

At the Deutsche Kautschuk-Gesellschaft (German Rubber Society) 1958 Rubber Conference,[1] held in Cologne, Germany, May 7-10, a new synthetic rubber, said to have more rubbery characteristics than natural rubber, was announced by W. L. Semon and D. Craig, both of The B. F. Goodrich Co., Akron, O. The new material, known as deuterio rubber, has been produced to help scientists determine the properties and the nature of rubber. It was said that scientific studies of the new material should lead to improvements in the quality of rubber products

The new rubber, synthesized at the B. F. Goodrich Research Center by a team headed by Dr. Craig, was sponsored by Goodrich-Gulf Chemicals, Inc., Cleveland, O. It was stated that continued research with deuterio rubber will bring a much more complete understanding of rubber and of the rubbery state in the fields of heat, radiation and oxidation resistance, as well as gas permeability.

Deuterio rubber, whose high cost restricts its use to that of a research tool, is more rubbery than other rubbers because of its unique molecular composition. In deuterio rubber heavy hydrogen (deuterium) atoms, obtained from heavy water, replace the conventional hydrogen atoms attached to the carbon chains in the molecules of ordinary rubbers. Because molecules con-

[1] See RUBBER WORLD, Mar., 1958, p. 890.

taining deuterium atoms attract each other less strongly than do those containing hydrogen atoms, this exchange results in a more fluid, elastic rubber. As a step in the synthesis of deuterio rubber, completely deuterated isoprene was prepared.

Deuterio rubber can be vulcanized exactly like natural rubber, it was said. It gives good tensile qualities in pure gum stocks and does not require carbon black reinforcement to develop high tensile properties.

This preliminary work indicates that the new rubber has many interesting properties and that some may be superior to those of crude rubber. Eventually, it is stated, a rubber of this type might be made and used for some very special purposes.

Improved Pearl Paste

Claremont Pigment Dispersion Corp., Roslyn Heights, L. I., N. Y., has successfully completed initial production lots of a new solvent-free pearl paste designed for use in pigmenting vinyl compounds. This product is said to insure a pearl concentrate completely free of volatile solvents and non-settling after one year of storage. Said to eliminate previous drawbacks, this product should aid vinyl compounders in maintaining product uniformity. The new pearl concentrate, Claremont Code No. D-4758, contains 70% active pearl essence and is priced to meet competition.

Bachner Award Dinner

Winners of the 1958 Bachner Award Competition[1] for the most unique new use of molded, extruded, or formed plastics will be honored at a special dinner to be given in Chicago, Ill., November 18, by Chicago Molded Products Corp., John Bachner, president of the company, announced recently.

The dinner will be held in the Gold Coast room of the Drake Hotel. In the adjoining French Room a "Parade of Plastics Progress" will be exhibited, consisting of a number of interesting and exceptional plastic items created over a period of many years. Also to be shown are the most interesting entries to the Bachner Award Competition. The dinner is being given at the time of the plastic industry's eighth National Plastics Exposition and Conference to be held this year at the Chicago Amphitheatre.

Further information and entry forms can be obtained by writing to Wm. T. Cruse, secretary, Bachner Award Committee, c/o Society of Plastics Industry, 250 Park Ave., New York 17, N. Y.

[1] Rubber World, Apr., 1958, p. 128.

CALENDAR of COMING EVENTS

June 16-17
The Rubber Manufacturers Association, Inc., Molded & Extruded Goods Subdivision. Annual Meeting. The Homestead, Hot Springs, Va.

June 20
Boston Rubber Group. Outing. Andover Country Club, Andover, Mass.

June 22-27
ASTM. Annual Meeting. Hotel Statler, Boston, Mass.
(D-11 and Subcommittees, June 25-27.)

June 27
Detroit Rubber & Plastics Group, Inc. Outing. Western Golf & Country Club.
Washington Rubber Group. Annual Outing. Bethesda Country Club, Bethesda, Md.

July 25
Chicago Rubber Group. Golf Outing. Medinah Country Club, Medinah, Ill.

August 5
New York Rubber Group. Golf Tournament. Wingfoot Country Club, Mamaroneck, N. Y.

August 22
Philadelphia Rubber Group. Golf Outing.

September 3-5
First National Conference on the Application of Electrical Insulation. Cleveland, O.

September 6
Connecticut Rubber Group. Outing.

September 7-12
American Chemical Society. Chicago, Ill.

September 9-12
Division of Rubber Chemistry, ACS. Hotel Sherman, Chicago, Ill.

September 25
Fort Wayne Rubber & Plastics Group. Van Orman Hotel, Fort Wayne, Ind.

October 3
Detroit Rubber & Plastics Group, Inc. Fall Meeting. Detroit-Leland Hotel, Detroit, Mich.

October 7
The Los Angeles Rubber Group, Inc. Biltmore Hotel, Los Angeles, Calif.

October 14
Buffalo Rubber Group. Fall Meeting. Hotel Westbrook, Buffalo, N. Y.

October 17
New York Rubber Group. Henry Hudson Hotel, New York, N. Y.
Boston Rubber Group. Fall Meeting. Hotel Somerset, Boston, Mass.

October 17-18
Southern Rubber Group. Roosevelt Hotel, New Orleans, La.

October 21
Elastomer & Plastics Group, Northeastern Section, ACS. Annual Meeting. Science Park, Charles River Dam, Boston, Mass.

October 24
Philadelphia Rubber Group. Poor Richard Club, Philadelphia, Pa.

November 14
Philadelphia Rubber Group. Dance.
Connecticut Rubber Group.

November 17-21
Eighth National Plastics Exposition. Society of the Plastics Industry. International Amphitheatre, Chicago, Ill.
National Plastics Conference. Hotel Morrison, Chicago.

December 2
Buffalo Rubber Group. Christmas Party.

December 4
Fort Wayne Rubber & Plastics Group. Van Orman Hotel, Fort Wayne, Ind.

December 12
New York Rubber Group. Christmas Party. Henry Hudson Hotel, New York, N. Y.
Detroit Rubber & Plastics Group, Inc. Christmas Party. Sheraton-Cadillac Hotel, Detroit, Mich.
Boston Rubber Group. Christmas Party. Hotel Somerset, Boston, Mass.

1959

January 30-31
Southern Rubber Group. Statler Hotel, Dallas, Tex.

February 3
The Los Angeles Rubber Group, Inc. Biltmore Hotel, Los Angeles, Calif.

February 6-8
Boston Rubber Group. Annual Ski Week-End. White Mountains, N. H.

February 12
Fort Wayne Rubber & Plastics Group. Van Orman Hotel, Fort Wayne, Ind.

March 3
The Los Angeles Rubber Group, Inc. Biltmore Hotel, Los Angeles, Calif.

April 7
The Los Angeles Rubber Group, Inc. Biltmore Hotel, Los Angeles, Calif.

April 16
Fort Wayne Rubber & Plastics Group. Van Orman Hotel, Fort Wayne, Ind.

WASHINGTON REPORT

By JOHN F. KING

O'Sullivan-URW Strike Contributes To Stalemate on New Labor Legislation

In May, 1956, the United Rubber Workers' strike at the Winchester, Va., plant of O'Sullivan Rubber Corp. began. Heading into its third year now, the struggle between the company and the union is no closer to settlement than it was when URW Local 511 walked out on May 13, two years ago. But the strike is fast becoming the hottest issue in labor-management relations, and it will get hotter, not simply in Winchester or the rubber industry, but on the national scene.

The Problem in Congress

The O'Sullivan strike, for example, has presented the Senate Labor Subcommittee of Sen. John F. Kennedy (Dem., Mass.) with a touchy political issue that will, Senate leaders insist, be settled before Congress adjourns. It has split the House Subcommittee on Labor-Management Relations, headed by Rep. Carl D. Perkins (Dem., Ky.), right down the middle on partisan lines, producing a situation where little, if any, legislating can be done.

It has also put into the hands of national labor leaders a *cause celebre*, an issue that can be parlayed into important revision of the Taft-Hartley law. In the hands of labor, moreover, such an issue can do much to offset some of the bad publicity developed by the McClellan committee in its investigation of corruption in the labor movement.

Effect of May NLRB Order

The latest development in the O'Sullivan matter—a May 16 order from a National Labor Relations Board trial examiner to the URW to call off its picketing of the Winchester plant and its boycott of O'Sullivan products—can only heat up the issue more.

The recommended decision of Examiner George A. Downing, while not calculated to do so, will: (1) scarcely simplify Senator Kennedy's job of reporting out a "labor reform bill" which he and Senate Majority Leader Lyndon B. Johnson (Dem., Tex.) have promised before the end of this session of Congress. The Senators pledged labor legislation this session as a means of fending off a drive by Senate Minority Leader William F. Knowland (Rep., Calif.) in late April to overhaul national labor laws in a fashion most unsatisfactory to the AFL-CIO.

(2) Probably harden the division in the House Subcommittee between Chairman Perkins and the three Republican minority members. It is possible, however, that Downing's decision may light a fire under the subcommittee, providing the impetus to legislate, which has been missing since early in the session.

(3) Give new ammunition to labor leaders in their campaign to revamp the 1947 Taft-Hartley Act. They can be expected to point to the Downing decision as merely another injustice dictated by what is an iniquitous provision of law.

Briefly, Downing's ruling is this: Inasmuch as Local 511 of the URW "does not represent a majority" of O'Sullivan's Winchester employes, the union must cease and desist from its picketing of the plant and the International URW from continuing its national boycott of O'Sullivan products. Downing, who termed such actions as "unfair labor practices" because they "restrain and coerce" O'Sullivan and its employes in the exercise of rights, gave the local and the international affiliates 20 days to cease and desist. If the unions fail to comply, he recommends that NLRB force them into line with his decision. His "intermediate report" on the O'Sullivan case came down after the company had filed charges with NLRB's General Counsel and the General Counsel on February 12 issued a complaint.

Indications from URW leaders are that the Union will appeal the Downing decision to the NLRB, asking that the examiner be overuled in his decision. Union spokesmen can be expected to argue that if carried out, Downing's decision will cancel the Union's legal rights to effectuate picketing and primary boycotting. URW officials, however, are not hopeful the NLRB will bow to their wishes. If the Board upholds the Examiner as they anticipate, they will take the case to court. They expect the litigation ultimately to reach the Supreme Court. Whatever happens, they believe a stay of the Downing order will be granted, either by NLRB or by a court through an injunction.

Taft-Hartley Inequity

Why should the Downing decision cause such a stir? More than likely because it will be construed, not just by labor leaders, as in fact the latest embroidery on what is basically an inequity, an embroidery directed by law.

Sen. Robert A. Taft himself before his death recognized the injustice to labor of that section of the Taft-Hartley Act which prohibits "economic strikers" from voting on their own union's decertification. President Eisenhower in 1952 pledged repeal of that provision because "I know how the law might be used to break unions." Labor Secretary Mitchell likewise has campaigned for repeal of the economic strikers' provision. All realized that the provision—Section 9 (c) (3) of Taft-Hartley—could be employed as a union-busting device by authorizing a struck company to bring in strikebreakers, have them petition for decertification of the striking local, and, then, in an election at which striking union-members could not vote, oust the local as the exclusive employe bargaining agent with the company.

The 1956 Story

This is what happened at Winchester in 1956.

On May 13 that year, after the company refused a union proposal for federal mediation on employe demands for wage increases, paid holidays, and fringe benefits, Local 511 walked out. The strike vote was 355-2; there were 422 workers in the plant. Post-strike negotiations deadlocked; the International URW in April of last year, after the strike had been on 11 months, launched a national boycott of O'Sullivan products when the Local charged the company with not negotiating in good faith.

The boycott began about the time new employes, which O'Sullivan had brought in when the strike began, petitioned NLRB for decertification of

Local 511, alleging they no longer cared to be represented by the striking union. After NLRB ruled on September 26 that striking unionists "are not eligible to vote" in accordance with law, an election on October 18, 1957, resulted in the decertification of Local 511, by a vote of 288-5.

URW "Unfair"

The NLRB General Counsel complaint, on which Downing ruled last month, grew out of company charges that URW, local and international, was improperly attempting to negotiate a contract with O'Sullivan even though it was no longer bargaining agent. The evidence, Downing said—noting that the URW did not dispute it—was that picketing continued, and the boycott was pressed in the interests of winning for employes "a fair and reasonable contract" with the company.

From the time of its decertification in October of last year, Downing concluded, URW therefore "engaged in unfair labor practices within the meaning of Section 8 (b) (1) (A)" because it did not represent O'Sullivan's employes. The Examiner noted that his decision "is plainly controlled" by two other NLRB rulings which constitute "binding precedents."

The Congressional Stalemate

Had the Senate listened to Minority Leader Knowland instead of voting down on April 28 by a 50-33 vote his proposal to repeal the economic strikers' provision, and had the House followed suit, perhaps the Downing decision would be academic. It also might have been entirely beside the point had the Perkins Subcommittee of the House acted earlier this session when it tried and failed to repeal this provision. But it seems other factors, which cannot be divorced from this issue, intervened to create as much of a stalemate on corrective legislation as there exists between URW and O'Sullivan.

Senate Democrats promise a labor reform bill, including adjustment of the economic strikers' provision. Capitol Hill insiders, howver, are betting that such a bill will never see the light of day. Senator Knowland, who espouses a right-to-work law that is completely unacceptable to labor leaders, must have a say in the writing of new legislation. There is still strong anti-labor sentiment, growing out of the revelations of the McClellan Committee, that would have to be appeased in any reform legislation. All these factors must be weighed in pushing through any kind of legislation, and Senators Johnson and Kennedy, whose ambitions cannot allow the alienation of any important group, must bear them in mind. The "conflict of interest" surrounding a reform bill, therefore, makes it a poor prospect for this session and perhaps the next with a presidential election year coming up.

Without the heavy overtones of personal ambitions, the same "political" situation exists in the House Subcommittee. Chairman Perkins and his three Democratic colleagues want very much to go into the economic strikers' issue and write legislation. But they have had to back away from the question every time it comes up because the three-man minority, led by Rep. Carroll W. Kearns (Rep., Pa.) insists on taking up three other issues unpalatable to labor: "areas of jurisdiction" between NLRB and state agencies—this could open the way, one labor source believes, "to all sorts of right-to-work nonsense"; the "entire problem of secondary boycotts"; and a redefinition of the powers of the National Labor Relations Board.

The Subcommittee Democrats have a further problem in that the Chairman of the full Labor and Education Committee, Rep. Graham Barden (Dem., N. C.) has anti-labor tendencies that could be aroused to the point where he would be working against his fellow Democrats. The situation in the subcommittee is so tense that at one point recently, when the group was deadlocked 3-3 on the question of whether to hold hearings on the O'Sullivan case and the economic strikers' provision, Chairman Perkins had to desert the Democrats and vote *against* hearings for fear of producing a "Kohler investigation." The reference is to the excursion of the McClellan Senate Committee into the four-year-old UAW strike against the Kohler plumbing fixture firm, which produced personality clashes aplenty, but no substantive legislation. And if he doesn't get a "Kohler situation" by pushing ahead with hearings, Perkins must consider the risks that the end result could be "punitive" labor legislation.

United Rubber Workers Ask for Wage Talks; Big Four Companies Ask for Moratorium

Collective bargaining between the United Rubber workers Union and industry management on wage increases and fringe benefit liberalizations, theoretically a private affair, was launched by both sides as a thoroughly public issue during May.

On May 2, URW General President L. S. Buckmaster notified Goodyear Tire & Rubber Co. and The B. F. Goodrich Co. that he planned to open contract discussions on wage increases "that will stimulate employment by putting badly needed dollars into the hands of consumers." The URW notification was unusual in that two companies were picked for negotiations; in the past the union has worked with one of the Big Four on a contract which sets the pattern for the industry. Firestone Tire & Rubber Co. on May 9 received a similar notification.

Big Four on Wages

Also on May 9, the three companies, along with United States Rubber Co., responded to Buckmaster's proposals. The Big Four's answer, delivered while URW's international policy committee was meeting in Cincinnati, was a request to the union to put off negotiations on wages hikes and other benefits this year. In identical letters, the companies urged Buckmaster to agree to a moratorium on wage boosts because the rubber industry "is one of the hardest hit" in the current recession.

The Cincinnati meeting of the Union policy committee voted down the request and went on record demanding a "substantial and adequate wage in-increase" for the union's 180,000 members. Apart from wage demands, the policy committee set as an objective a hike in supplemental unemployment benefits from the present 65% of weekly pay, including state benefits, to a full 100%. This is, in effect, a guaranteed annual wage.

In their May 9 reply to the Union, the Big Four argued that the drop in automobile production has seriously affected the rubber industry. It said "thousands of our employes are now on layoffs." The companies also noted that current average straight-time hourly wage for URW workers in Big Four plants is $2.51. Addition of 68¢ an hour in fringes brings the average hourly rate to $3.19.

This total, according to the Big Four, results from "exhorbitant" wage and benefit increases over the past three years, averaging 7% each year. The upward rise, which the companies contend is substantially greater than increases received by other industrial workers and nearly triple the rise in the cost of living during the period, has "seriously damaged our competitive position in non-tire plants. . . ."

"Higher unit labor costs have been a major source of higher prices which the consuming public is now showing its unwillingness to pay," they said.

The companies suggested that any discussion of wage increases be put off until April, 1959.

The Union's demands had been served upon the Big Four at a May 6 informal meeting between Buckmaster and company officials. Following these developments, between May 2 and May 12, word of the companies' stand on a moratorium became public. Goodrich's reply to Buckmaster was sent to all its employes; copies of the industry's letter to the Union also were made available to the press.

URW "Forward Approach"

On May 15, Buckmaster made public his answer to the companies' "propaganda," to explain why the union's "forward approach" is "in the best interest of the general public, industry, and union members." The Buckmaster letter said in part:

"We cannot accept your [the Big Four's] proposition that we can work our way out of a depression by lowering the purchasing power of the wage earners or anyone else. We are convinced that a general wage increase and more adequate retirement benefits will stimulate employment by putting badly needed dollars into the hands of consumers. In turn, those dollars will put reality into the 'Buy Now' campaign which I am sure you endorse.

"We ask you to join with us in rejecting pessimism concerning the industry's future. Surely you must recognize that the growth and prosperity which the industry has enjoyed during the past twenty years has been due in large measure to the fact that negotiated wage and fringe benefit increases have made it possible for workers to buy more of the products manufactured."

In his mid-May reply the URW chief took swipes at both the companies' contention that the industry "is one of the hardest hit in this business slump," and the "big business policies of the present National Administration." He dismissed the industry's slideoff in first-quarter sales and profits as "simply a falling away from the extremely high levels" reported by firms last year.

"Compared with any normal year," he stated, "sales and profits for the first quarter of 1958 are surprisingly good."

Taking note of the public nature of the negotiations so far, Buckmaster said that the Union is "saving some of our information and most of our proposals for presentation to you across the bargaining table when we meet in the near future. Perhaps it is a bit old-fashioned to proceed in that manner, but we think it holds the best promise of maintaining industrial peace in our industry."

NSF Conference on Research and Development Stresses Need of More Effort by Industry

An estimated 500 economists and scientists heard a series of noted speakers discuss the impact of research and development programs of both government and industry on the national economy at the National Science Foundation's May 20 conference at the Shoreham Hotel here.

Rubber R & D Spending Up

The meeting was devoted to NSF's thesis that industry—which accounted for slightly less than half the $9 billion spent on research and development in 1956, the latest year for which there are statistics—must do more if it wants to help itself. A survey was circulated by NSF during the conference showing that although direct Federal Government expenditures in this field totaled only $1.4 billion two years ago, Uncle Sam was indirectly responsible for putting up more than half the $6.5 billion "cost to industry" of R & D in 1956. Nonetheless, the survey demonstrated NSF's gratification that R & D expenditures, no matter who picked up the bill, jumped 76% in 1956 from the total of $3.7 billion just 3 years before.

The survey put forward figures showing the rubber industry's share in the total outlay. In 1953, research and development on rubber products cost the industry $53.6 million. By 1956 this figure had jumped by nearly 54% to more than $82 million. This total fell about midway between the high and low marks recorded for 14 industry groupings. NSF also noted that R & D in the rubber industry during the period emphasized the perfection of new, marketable products.

Views of Economists

A summary of some of the formal speeches that were addressed to the conference follows:

Sumner H. Slichter, noted economist, said that modern economic theory must take fuller account of technological research, which has introduced fundamental changes into the operation of the industry economy. The role of research progress in refreshing a slowing product demand is coming to be understood better. The "industry of discovery" pursued for profit is producing a rising instead of a diminishing schedule of marginal utility; it creates investment opportunity and affects demand for capital goods. The government, therefore, has a serious responsibility in determining policy for the support and encouragement of research that benefits the nation as a whole.

Ralph E. Burgess, American Cyanamid Co. economist, pointed out that the competitive position of each firm in the chemical and allied products industries is largely dependent upon successful research, since new products often completely preempt old ones from the market. It is possible that half our present chemical products may have no commercial value 10 years from now. The rapidly changing and expansive nature of industry poses two questions for the individual company: How large shall the research program be; and how may we find a better means for deciding how much should be spent on research? The obvious answer to the first question is that one firm dares not "do less" than its competitor. The answer to the second is that more data are needed in the area of research economics. The risks of R & D investment can be reduced by an increased study program by both industry and government.

Guy Suits, General Electric vice president and research director, reported that at G-E, economic studies are revealing the inseparable relation between basic research and commercial objectives. A prime example was Bell Telephone Laboratories' encouragement of research on the "semi-conductor phenomena" which led eventually to the remarkable development of the commercially attractive transistors. The challenge to industrial research management affords a creative environment to deal effectively with multiple skills amid increasing complexities. Communications must be improved to hasten the recognition and appraisal of scientific results.

Robert E. Johnson, Western Electric Co. economist, said that technological achievement must be matched by effective and efficient utilization of resources through scientific management. Here logistics research has a vital role to play in assuring optimum assignment of limited resources. Logistics research is a technique of problem analysis which utilizes not only the social science disciplines of economics, psychology, sociology, econometrics, human engineering, and motivation research, but also mathematics, engineering, and other natural sciences. Logistics research analyzes the flow of information for decision-making in business operations. Scientific management can result in an economy of effort and higher living standards through the efficient allocation of R & D resources.

Martin R. Gainsbrugh, chief economist of the National Industrial Conference Board, stated that economists' "early warning system" of statistical tools failed to predict the current recession because they were inadequate. Our inventory statistics are too late and too few. While the great bulk of the nation's total research expenditures are directed toward the physical sciences, business, in its own interest of knowing what's ahead, must inevitably produce much of the required new system out of its own pocketbook—indirectly, in its contributions to education and research institutions and in its tax payments, and directly, in its own research payrolls.

Charles Hitch, The Rand Corp., said that the competitive R & D of business could teach the military services that "multiple paths" of study achieve many research objectives most efficiently; the greater the risk, the more duplication and "apparent" waste make sense; the best person to "choose a path" is not the administrative bureaucrat, but the researcher himself; there is no sense in suppressing competition in federal military R & D, but only in diverting it into more productive channels.

Missile Expert Warns on Rubber Supplies; No NR Stockpile Cut Likely This Year

None other than Wernher von Braun, the Army's top rocket expert, is in favor of the synthetic rubber industry. He has confidentially advised inquiring Senators that "should we lose Indonesia and/or Malaya as a source of rubber in time of war, we should have at least a skeleton synthetic rubber industry in readiness to expand rapidly."

But on the other hand, Dr. von Braun believes, "We probably would be foolish to switch completely to synthetic rubber production right now to meet the demands of the American automotive industry."

The views of the former German missileman were solicited by the Senate Interior and Insular Affairs Committee. Chairman James E. Murray (Dem., Mont.) in May sent Committee experts to von Braun's headquarters in Huntsville, Ala., to get his ideas on what productive capacity is needed by this country against a day when it may be fighting a war without traditional overseas materials suppliers available to help out. The Senate Committee was most interested in his views on nonferrous metals, hoping the scientist would endorse their arguments that Western mining industries need protection from imports. In a general way, von Braun proffered his endorsement. He appears to have volunteered his views on the essentiality of the synthetic rubber industry.

In discussing the dependence of the United States on imported raw materials, von Braun said it is "definitely the case" that enemy submarines could knock out South American, European, and African ports with sea launchings of atomic-armed missiles. The implication was plain, from the text of the interview prepared for Senator Murray, that the United States should provide itself with a hedge against emergency shortages by insuring itself of plenty of materials supplies.

The von Braun testimony comes at a time when the federal agencies are studying the conclusions of the Pettibone Special Stockpile Advisory Commitee. The advisory report urged, without directly stating it, that the 1¼-million ton hoard of natural rubber now on hand be pared down sharply in accordance with new mobilization concepts. According to the semi-annual report to Congress by the Office of Defense Mobilization on the stockpile, the Pettibone findings "are being reviewed . . . in a reappraisal of stockpile policies and programs."

ODM gave no further details. Officials said informally little more than what the report to Congress stated: the whole matter of stockpile readjustment remains "under study." The semi-annual report did specify, however, that in the period July 1-December 31, 1957, a total of 23,324 long tons of rubber was rotated out of the defense warehouse. It said 15,541 tons of the total were rotated for upgrading purposes; while the remaining 7,783 tons were straight rotations.

Rubber experts keeping a close eye on ODM and its action on the Pettibone recommendations were confident there would be no liquidations this year. Public Law 520, which prohibits stockpile reduction without Congressional authorization, still interposes a bar to administrative cuts in supplies on hand. ODM, moreover, has made no sign so far of seeking Congress's approval for any liquidations, even though the current session is nearing an end. The experts believe any move in that direction by ODM, with its promise of adverse price reactions on the market, should not be looked for until economic conditions improve.

Sadlak Bill on Footwear Imports Likely To Become Law Despite Importer Objections

Importer interests managed to upset the Senate's time table of action on the Sadlak bill to close the latest-discovered loophole in the rubber footwear tariff, but the delay was only temporary. The Senate Finance Committee, after a one-shot public hearing to give the importers a day in court, May 19, went on to approve the legislation by voice vote and sent it to the Senate floor where final approval was virtually certain. The final step, a Presidential signature making it law, also appears a certainty since the State Department has expressed no objection to the bill.

As passed by the House in April, H. R. 9291, introduced by Rep. Antoni N. Sadlak (Rep., Conn.), would assure that importers do not evade the full tariff by the simple addition of pieces of leather to the uppers of rubber-soled fabric footwear. This practice has enabled footwear imports to enter U. S. customs as a product whose chief value is leather and thus escape paying a duty based on "American Selling Price" principle. Entering as a leather product, in effect, means a sharp reduction in import duties.

RMA Comments

At the May 19 Senate Finance Committee hearing, a four-man committee representing the Footwear Division of The Rubber Manufacturers Association, Inc., reminded Senators that "failure to enact this bill would be denying to this industry vital tariff protection which Congress intended it to have." The industry group, led by A. P. Funk, president of LaCrosse Rubber Mills Co., included W. H. Smith, president of Bristol Mfg. Corp., W. E. Brimer, president of Tyer Rubber Co., and J. J. Brady, sales policy manager of United States Rubber Co.

Mr. Funk went over some of the history of loophole-exploiting carried out by footwear importers. He noted that Congress in 1954 closed one loophole—an importer device of inserting leather strips into the soles of fabric footwear, thus getting by Customs shoes judged to be "in chief value leather" at a lower duty.

Mr. Funk argued that the pending Sadlak bill was offered in the same spirit as the earlier loophole-plugger. Harking back to the 1954 legislation, he said that "with the door slammed on the sole trick, the importers simply applied the same gimmick to the upper. This was not unforeseen by the American manufacturers, or by members of Congress, and other responsible government officials." He said the domestic producers tried to stretch the blanket of protection offered by the 1954 "sole" bill to cover the "upper" situation, but that it was found new legislation was needed.

Importer Objections

Contesting the position of the RMA delegation was attorney and former State Department Far Eastern expert Noel Hemmendinger. Representing the Sundries Division of the Japanese Chamber of Commerce of New York, Mr. Hemmendinger had succeeded in getting the Finance Committee to hold a hearing on the Sadlak bill. There had been no House hearings. On the motion of Committee members Senators Paul A. Douglas (Dem., Ill.) and Albert Gore (Dem., Tenn.), the Finance panel heard Mr. Hemmendinger and the RMA delegation.

The importer attorney charged that the "American Selling Price" principle, as "abusively" administered by the Customs Bureau, is the "U. S. Rubber Co. retail price" on its Keds line. He said this interpretation affords "fantastic protection" to the whole American footwear industry. Hemmendinger argued that if the American producers want protection from imports, let them pursue the established channels of relief in the "escape clause" of the Trade Agreements Act. He recalled that RMA's Footwear Division was thrown out of the Tariff Commission last September on such an appeal, because USTC found "no injury was shown, imports being less than 3% of domestic production."

Contending that there is "nothing improper or illegal about designing a product so as to enjoy a favorable

tariff rate," Hemmendinger urged the Finance Committee to sit on the Sadlak bill until USTC finishes its revision of U. S. tariff schedules. Once the tariff technicians have had a look at the footwear schedules, he said, legislation might then be in order.

The Senate passed the Sadlak bill on May 22, and signature by the President is expected momentarily.

S-11 "Good Faith" Bill Dead; Tire Ad Guide Due

The "Good Faith Bill," a controversial piece of legislation that has caused a split between the rubber manufacturing industry and independent retail distributors, appeared dead in Mid-May. The bill (S-11) would severely limit the right of a seller to meet the lower price of a competitor by nullifying the "good faith" defense against price discrimination under the Robinson-Patman Act.

Although the legislation has strong support in the Senate Judiciary Committee and probably would pass the Senate if the Committee could report it to the floor for a vote, word from the House is that, for this session at least, the bill is dead. House Speaker Sam Rayburn (Dem., Tex.) reportedly has decided it would not be "good legislation." The Senate Committee was scheduled in late May to begin voting on various diluting amendments to the bill in an attempt to break it loose for a floor test.

Reports that Rayburn is against the bill—an important switch inasmuch as the House in 1956 voted overwhelmingly in favor of the "Good Faith Bill" —were taken as an almost sure sign the bill is finished. The powerful Texan is said to reflect the turnabout thinking in the lower chamber that "there are too many Congressmen who are for the bill publicly, but against it privately." This feeling reportedly is producing a situation where nobody wants to stand up and be counted as either for or against the bill.

This situation develops, reports indicate, because when "Good Faith" breezed through the House two years ago, only the advocates were heard on the issue. It wasn't until the legislation reached the Senate that the opponents woke up and set about undercutting the proponents. The fight over "Good Faith" took its crucial turn last year when oil industry retailers split wide open on the bill.

The Rubber Manufacturers Association on March 15 wired the Senate Judiciary Committee that industry management vigorously opposed the bill. RMA said it was particularly opposed to a reported amendment in Committee to limit applicability of S-11 to the food, drug, cosmetic, and automotive products industries. The last category was described to mean "all original and replacement equipment and parts," including tires, batteries, and accessories which "may be used in construction, maintenance or repair" of autos. RMA said such an amendment would be discriminatory. The National Tire Dealers & Retreaders Association, on the other hand, has been a staunch supporter of the bill.

Another rubber industry marketing issue, formulation by the Federal Trade Commission of an industry-wide code of ethics for tire advertising, appeared to be moving toward final resolution. FTC staff experts were known to have finished the drafting job and forwarded the 11-point guide to the Commission for final approval. There was no word from FTC at press time on when the guide could be expected, but industry sources expected it before the end of May.

INDUSTRY NEWS

Freight Rates Reduced On Rubber and Tires

The Rubber Manufacturers Association, Inc., New York, N. Y., reports that its traffic committee has negotiated several substantial reductions in rail and ocean freight rates. Reductions ranging up to 25% were granted on contract ocean freight rates on synthetic rubber moving from United States gulf ports to Europe and the United Kingdom.

The rate on synthetic rubber consigned to Atlantic ports at Bordeaux, Dunkirk Range, Antwerp, Ghent, Rotterdam, and Amsterdam was dropped from $1.60 to $1.20 per hundredweight. The rate to Hamburg, Bremen, and Bremerhaven was cut from $1.75 to $1.35 per cwt., and the same reduction was made applicable to shipments to five U. K. ports, Avonmouth, Glasgow, Liverpool, London, and Manchester. The rate on shipments to Scandanavian and Baltic ports was reduced from $1.75 to $1.45 per cwt. The new rates became effective in April.

The Eastern Railroads advised the committee that they would cut freight rates on crude natural rubber moving from Atlantic ports to the Akron area by about 10%, effective May 1, 1958, or from 92¢ to 81¢ per cwt. Southwestern Railroads plan to reduce carload rates on all synthetic rubber moving from southwestern points to the Akron-Detroit area from $1.11 per cwt. on the basis of 70,000 pounds to $1.00 per cwt. on the basis of 80,000 pounds minimum. This procedure, however, requires approval of the Eastern Railroads before it can become effective.

Eastern Railroads have recommended continuation of the present rates on tires and tubes in eastern territory based on shipments of minimum weights of 10,000 and 20,000 pounds, but propose new rates approximately 15% lower on shipments based on a minimum of 30,000 pounds. The committee expects the new rates to be made applicable by the carriers in the near future.

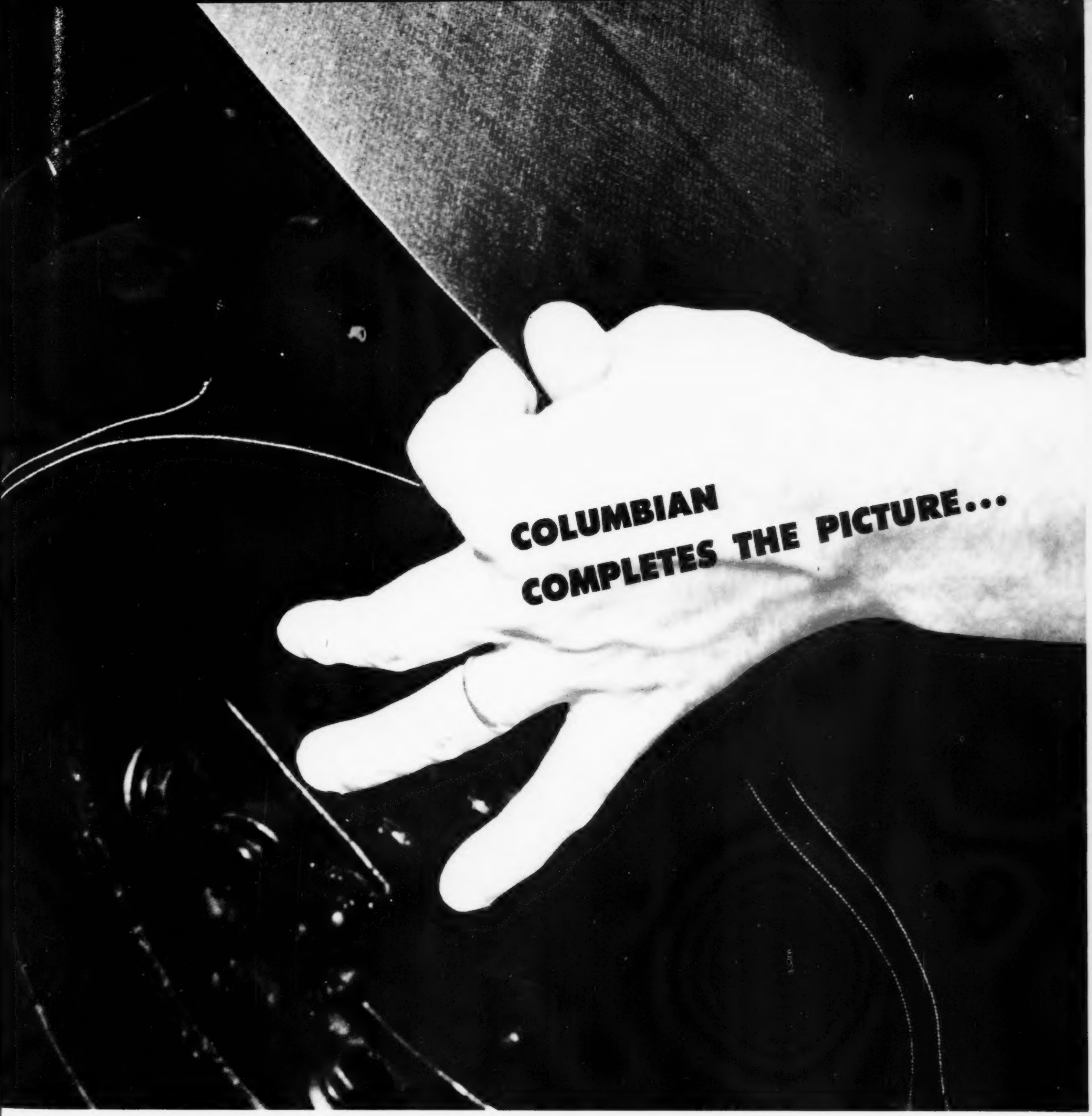
New O-Ring Process

MinJecto, a new process for producing O-rings has been announced by Minnesota Rubber Co., Minneapolis, Minn. This improved manufacturing process which permits automation in O-ring production will revolutionize the industry, it is reported. A big advancement, MinJecto is a further refinement of injecting molding pioneered by Minnesota Rubber.

It was reported that the company's engineers have been working to perfect MinJecto over a three-year period. After much laboratory work and engineering the process has been perfected and tooling has been completed to produce O-rings in sizes one through 27.

These O-rings will be made of the standard nitrile compound 366Y, to produce highest quality O-rings that are said to be flash-free, have high density and exceptionally close tolerances at great reductions in production costs. This method is claimed to enable the company to make a large scale downward revision of its O-ring prices in sizes one through 27. Another advantage of this new process is that it makes it possible for the company to institute a policy of 24-hour delivery service.

For more information on MinJecto O-rings and for a copy of the company's price list write to the company.



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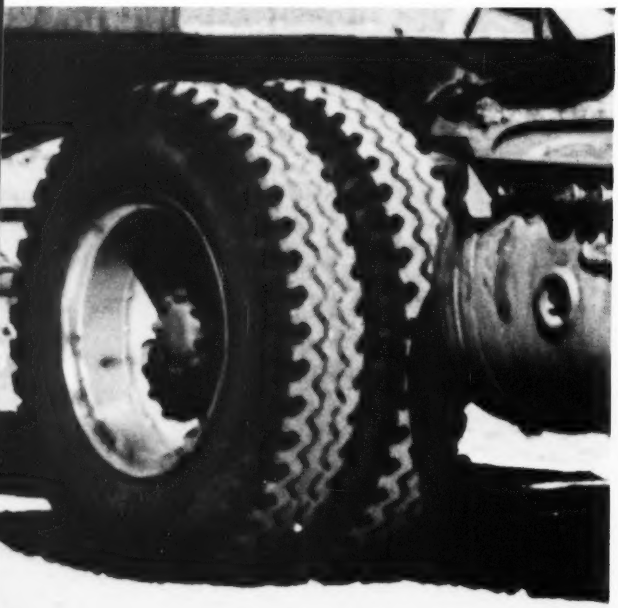

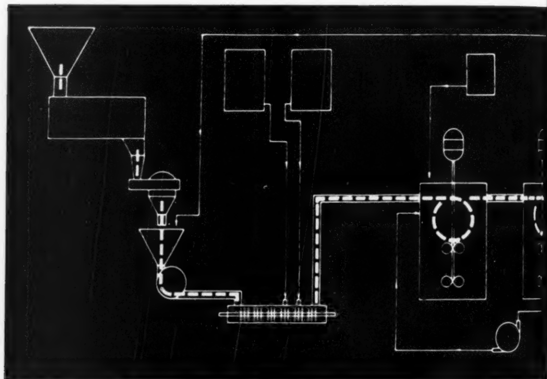

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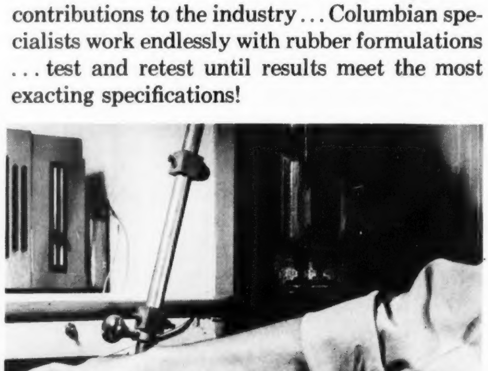

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STATEX-M FEF Fast Extruding Furnace
STATEX-93 HMF High Modulus Furnace
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FURNEX® SRF Semi-Reinforcing Furnace

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Columbia-Southern Dedicates Research Lab

A new research laboratory building, which offers the company's scientists the opportunity to continue their quest for new and better chemical processes and products under the best working conditions at Columbia - Southern Chemical Corp.'s Barberton, O., plant was dedicated May 1. The three-story air-conditioned building contains 68,000 square feet of floor space, of which 43,300 are now occupied. Ample room for the future is thus provided. Also included in the new facilities is a complete reference library.

Prominent features of the one- and two-man laboratories are stone-top work benches, pyrex piping to handle corrosive liquids, central utilities, and the latest laboratory equipment. A unique safety innovation is provided by escape doors between laboratories which provide a fast emergency exit in case of an explosion, fire or other accident.

competent and inspiring teachers in the schools.

At the formal ribbon-cutting ceremony, on the steps of the new research building, the guests heard H. W. Rahn, Columbia-Southern research and development coordinator, say that the firm's expansion story is another example of what can be accomplished by organized teams working toward worthwhile goals. He added, beautiful buildings with ultra-modern furnishing and equipment merely set the stage for the actors to move in and carry out their parts. Following this speech, the guests took a guided tour of the new and old laboratories.

Other dignitaries at the event were E. T. Asplundh, board chairman of Pittsburgh Plate Glass Co., Columbia's parent corporation; J. A. Neubauer, C-S president; Dr. Strain, C-S research director; and Barberton Mayor Catherine R. Dobbs.

Columbia-Southern's new research laboratory

Occupying the new structure is a staff whose combined basic and applied research efforts are under the direction of Franklin Strain, who is the director of research at the Barberton plant.

Preceding the formal dedication of the building was a luncheon attended by some 150 chemists, researchers, and industrial executives who heard J. C. Warner, president of Carnegie Institute of Technology, speaking on "Our Country's Most Paying Investment." Dr. Warner issued a challenge to American schools to produce more and better scientists and engineers, pleaded for a higher educational standard, and informed how the schools should go about getting it. He belittled the post-Sputnik renaissance in science education because it was motivated by panic rather than by the analysis of our situation and calm deliberation. He called for the number of science and math students in college to jump from its present 18-20% to at least 23% by the 1970's. He remarked that this figure could be reached if we provide more gifted students the opportunity of studying mathematics and science under

Columbia-Southern is known to other manufacturers through its and Pittsburgh Plate Glass's activities in the production of chemicals such as chlorine, soda ash, caustic soda, titanium tetrachloride, perchloroethylene, Hi-Sil, Calcene, and Silene rubber reinforcing pigments. These chemicals find use in the paper, soap, textiles, rubber, and dry cleaning industries.

The new research laboratory employs many building materials manufactured by Pittsburgh Plate Glass: Spandrelite structural glass, Soles heat absorbing windows, Herculite tempered glass doors, Carrara glass, foam glass insulation, Nucite glass blackboards, new resistant laboratory floor paint recently introduced under the name of Durethane, and Columbia cement.

M-P Plans Expansion

Morningstar-Paisley, Inc., New York, N. Y., has announced that it plans an expansion of its latex and plastisol sales and technical departments. The company entered this field in October, 1957, when it purchased Federal Latex Corp. and Federal Chemical Corp., of Brooklyn, N. Y. S. Tisser, who headed this operation for Federal, continues as manager of the department for Morningstar-Paisley.

The firm stated that the first stage of the program has started with an expansion of the plastisol and latex sales and laboratory facilities, plus additional pilot-plant equipment at its New York location, to be followed by installation of large processing equipment with modern quality control devices at Clifton, N. J., adjoining the firm's Haberland plant. Completion of new facilities is expected by August, 1958.

Morningstar-Paisley is well known as a manufacturer of polyvinyl acetate and copolymer emulsions. Its experience with these materials and its expanding market have necessitated a broadening of its product line into the liquid vinyl chloride and natural and synthetic latex compounds.

The plastisol line, including organosols, will be trade named Morpasol and consist of flow-controlled formulations suitable for dipping, rotational, and slush molding techniques, as well as spray, roller, and knife coating types.

The latex compounds will be sold under two trade name designations, Morpalex, a prevulcanized system, for safer handling and improved heat and light stability; and Morpatex, a line of textile coating compounds to meet the needs of the upholstery, rug, and carpet industry.

Unique Conveyor Belt

B. F. Goodrich Industrial Products Co., Akron, O., has developed a steel cable reinforced rubber conveyor belt which is in service at U. S. Steel Corp.'s Gary, W. Va., coal preparation plant. One continuous flight of the belt climbs a 19-degree slope, raises 400 tons of rock an hour nearly 500 feet in its 1,500-foot course. The belt moves waste rock resulting from the coal process from the coal preparation plant in a valley to dump areas in an adjoining valley.

According to Goodrich, the cable belt is 30 inches wide and travels 412 feet a minute. Rock, crushed to eight inches or less, is deposited on the belt from a rock storage bin through a vibrating feeder. At the mountaincrest the load is transferred from the cable belt to a conventional belt for normal hauling to the dump sites.

Rated at 30,000 pounds' working tension, the cable belt is internally reinforced with 55 $\frac{3}{16}$-inch diameter aircraft control cables. The belt weighs 14.5 pounds per foot—more than 43,000 pounds over-all—and is ¾-inch thick. The belt is in continuous operation six days a week and is powered by a 250 horsepower motor.

A-S-H Molded Products; Industrial Supplier

A-S-H Molded Products Co., a subsidiary of A-S-H Industries, Inc., and a newcomer to the precision molded rubber parts field, has put into operation a modern rubber and synthetic molding plant, producing components for the Allen-Sherman-Hoff Co. and The Allen-Sherman-Hoff Pump Co. For industrial consumers of molded rubber and synthetic rubber parts, the formation of the new firm at Frazer, Pa., represents a new source of supply. Equipment and facilities are reported to be far in excess of the company's current and projected requirements.

It is said to be a company qualified

E. Bickhart *(left)* and H. M. Sellers

and able to undertake any molding problem where end-use demands critical control of manufacturing specifications, either chemically or physically.

Although the company is new, its personnel is both well known and long on experience in the field of molding precision parts for the original equipment manufacturer. Vice President E. Bickhart, in charge of manufacturing and sales, brings more than 25 years' experience in sales engineering of molded rubber parts. Vice President H. M. Sellers, technical service, adds more than 35 years' experience in molded products research and development.

The modern physical and chemical rubber laboratory is under the direction of Sellers and exerts complete control over every step of the plant's manufacturing process and carries on an active program of research and development. The services and experience of the lab group are made available, as needed, for the solution of problems confronting other manufacturers.

The yellow brick plant and warehouse were designed and constructed by Eastern Engineering Co., Reading, Pa. The main building houses manufacturing floor space, metal pickling facilities, shower and locker rooms for employes, the physical and chemical rubber laboratory, and office space. Off the main building is a wing, housing the power equipment for the plant. Adjacent to the main building is the warehouse, with 6,000 square feet of storage space. In the main building of the plant the firm has assembled the finest mills, presses, and vulcanizers available and arranged for their maximum, efficient operation.

The pickling room, off the main processing floor, is completely equipped to prepare metal parts for bonding.

The warehouse, adjacent to the main building and connected to it by a roofed-throughway, is laid out to take full advantage of modern warehousing techniques. All materials entering and leaving the warehouse are palleted and moved by Towmotor Forklift trucks.

Instron Moves Plant; Adds New Executives

Instron Engineering Corp., manufacturer of precision materials testing equipment, has completed the move from its former quarters in Quincy, Mass., to a new modern plant at 2500 Washington St., Canton, Mass. conveniently located a few minutes' drive from Boston at the junction of Routes 128 and 138.

Situated on a spacious 15-acre lot, the new single-story structure includes 18,000 square feet of manufacturing space and 7,000 square feet for administrative and engineering staff offices. Modern facilities include an engineering library, cafeteria, a hydraulic loading platform, and a roomy 120-car parking lot. The new building is designed to facilitate maximum production flow, and ample provision has been made to permit future expansion when desired.

Two executives have been added in key administrative posts—Sales Manager E. J. Tolle and Production Manager Robert O. Smith. Tolle comes to Instron from Ozalid, a division of General Aniline Film Corp. His new assignment is the establishment of regional sales offices throughout the United States.

Smith was management consultant for Bromfield Associates, Boston, Mass., before joining Instron. At Instron he is serving as production manager in charge of plant operations.

Avisco Improves Rayon Tire Cord

American Viscose Corp., Philadelphia, Pa., has instituted a program to convert its rayon tire yarn spinning capacity to production of "super super"-type yarn. Recent development work, conducted with major tire manufacturing companies, has indicated the superiority of this type of yarn for certain tire body constructions. The trend in tire manufacturing is in the direction of lighter weight and stronger yarns. "Super super" tire rayon, particularly in 1100 denier, is said to be finding great favor in the tire industry.

It was pointed out that the lighter-weight yarn has improved characteristics of higher fatigue and strength which make it possible to construct a tire of greater carcass strength with lighter body weight. The superior tire cord in 1100 construction, claims Avisco, is just about 50% stronger than previous-type cords and has a fatigue improvement of several times that amount.

American Visco has been supplying this new yarn in limited quantity for some time. Now all facilities will be converted to this type, with the ultimate elimination of previous yarns. It is estimated that conversion work will require several months for completion.

Starting in the early 1940's, 1100 denier was the original-type tire yarn used by the rubber companies. Subsequently, for more economic production, the tire companies requested and adopted 1650 denier and 2200 denier yarns. Through the years, yarn strengths have been improved vastly over the early types, and it is now apparent that the heavy 1650 and 2200 denier yarns actually give greater carcass strength to a tire than is required. Some tire designers have indicated recently that the 1100 denier construction has minimized previous difficulties encountered with high-speed tubeless tires of heavier construction.

Plastics Manufacturers Team To Visit Russia

Arrangements have been completed for a delegation of United States plastics manufacturers to visit the USSR. According to the joint USSR—U.S.A. agreement, signed in January, 1958, cultural, technical, and educational exchange teams were provided for. The arrangement specifically provided for a team to be composed of plastics manufacturers.

While many plastics were developed in the United States, a number were developed abroad. It has been important to keep abreast of foreign plastics research and development. With Russia having a plastics industry it is important that U. S. plastics manufacturers be informed on the progress that has been and is being made in plastics in the USSR.

The U. S. delegation was scheduled to arrive in Moscow on June 2 and to remain in Russia for 30 days. A comprehensive tour of the USSR plastics industry has been arranged. The Soviet delegation will come to the U. S. for a similar period in November. While here, the delegates will attend the Eighth National Plastics Exposition in Chicago, Ill., November 17-21. This is an industry-wide trade show sponsored by The Society of the Plastics Industry, Inc., New York, N. Y.

The members of the U. S. delegation are: C. Russell Mahaney, vice president, St. Regis Paper Co.; C. W. Blount, vice president, Bakelite Co., division of Union Carbide Corp.; R. E. Burke, associate director of research, E. I. du Pont de Nemours & Co., Inc.; Wm. T. Cruse, SPI executive vice president; J. E. Fitzgerald, manager, plastics division, Brunswick-Balke-Collender Co.; T. J. Kinsella, president, Barrett Division, Allied Chemical Corp.; V. V. Lindgren, technical director, plastics and resins division, American Cyanamid Co.; John J. O'Connell, president, Consolidated Molded Products Corp.; and Theodore Shevzov, Naugatuck Chemical Division, United States Rubber Co.

Thiokol Chemical Division Formed

S. M. Martin, Jr., vice president of Thiokol Chemical Corp., Trenton, N. J., has been appointed general manager of the newly formed chemical division of the company. D. E. Fish, assistant sales manager of industrial sales, has been named sales manager of the new division; while F. W. Wilson, manager of Thiokol's Moss Point, Mass., plant, has been named production manager of the chemical division plant at Trenton and at Moss Point.

The chemical division produces Thiokol polysulfide rubber, one of the first synthetic rubbers produced in this country, and Thiokol liquid polymers, the bases for many key products in the rocket and industrial field. Recently, the chemical division engaged in the marketing of urethanes.

In addition to the chemical division, Thiokol now has two other divisions consisting of the rocket division, under the direction of H. R. Ferguson, and the specialties division, which includes Hunter-Bristol and National Electronics Laboratories, under the direction of J. S. Jorczak.

F. W. Wilson, D. E. Fish, S. M. Martin *(left to right)*

Du Pont Reviews Nylon Tire Cord Developments

A tire yarn technical review, sponsored by E. I. du Pont de Nemours & Co., Inc., Wilmington, Del., was recently held in Akron, O., for tire company executives and technical personnel. Speakers were from three Du Pont technical organizations—industrial technical service, industrial products research, and industrial merchandising.

In the summary of the nature of the studies reported, it was noted that this third annual meeting covered material primarily of long-range significance, as compared with the two previous meetings in which reports had been principally on immediate problems of short-range nature. This fact was interpreted as a sign of maturity in nylon tire cord research, which will be represented in future basic tire construction, cord, and fiber studies to take full advantage of tire cord developments.

Technical areas covered by the speakers included hot stretching, post inflation, and reduced cord-content tires.

In discussing hot stretching, emphasis was placed on the desirability of using higher temperatures and tensions and longer exposures in the hot stretching of nylon tire cord. These more severe conditions are preferred for processing Type 700 nylon, which has improved resistance to heat, higher strength, greater toughness, and improved fatigue resistance. These performance advantages of Type 700 nylon, coupled with the installation of new hot stretching equipment, multistage units in particular, have opened the way for both substantial tire performance improvements and possible reductions in the cost of building nylon tires, it was reported.

The commercial reality within the past year of most inflation for passenger tires, together with its acceptance as an important new technique for building better and lower cost tires, was cited as being specially significant. It was stressed that post inflation now is being extended to the truck tire field where it appears to offer similar opportunities for improved cost and performance.

Speakers were J. W. Bolmeyer, supervisor of industrial technical service; D. H. Heckert, supervisor of tire merchandising; J. M. Swanson, laboratory director, W. G. Mikell, research manager, and D. E. Howe and J. W. Hannell, research supervisors of the industrial products research laboratory of Du Pont's textile fibers department.

Hercules Cuts Price of Natural Polypropylene

Hercules Powder Co., Wilmington, Del., has announced a 9¢-per-pound reduction in the base price of natural polypropylene, the revolutionary new thermoplastic. Hercules, said to be the only commercial producer of polypropylene in this country, began producing Pro-fax polypropylene in December, 1957. Effective April 28, the price per pound for Hercules natural polypropylene will be 56¢ in truckload quantities. The base price of Pro-fax in colors remains at 65¢ per pound.

Ross Plans Building

J. O. Ross Engineering Division of Midland-Ross Corp., New York, N. Y., recently broke ground for its new suburban Chicago office building. Participating in the Mt. Prospect, Ill., ceremonies were S. W. Fletcher, president of the Division; T. A. Lams, president of the Mt. Prospect Village Board of Trustees; G. F. Schuning, Ross sales engineer; R. D. Palm, Midwest machinery sales manager of John Waldron Corp.; and L. G. Janett, vice president and regional manager of Ross's Chicago office.

The new office building, expected to be completed this fall, will have floor space of approximately 12,500 square feet and will include facilities for Chicago personnel of John Waldron Corp. and for the recently acquired Hartig Extruder Division, both of which operate as part of the J. O. Ross Engineering Division.

Ross Engineering designs, fabricates, and installs air processing systems used in industrial heating, drying and curing operation in such diversified fields as the paper, rubber, plastics, automotive, textile, metal finishing and foundry industries.

Waldron designs and manufactures machinery for continuous coating, casting, waxing, laminating, impregnating, embossing, and other web processing operations associated with paper, textile, film, foil, steel, and rubber. Waldron also produces a variety of couplings for transmission of mechanical power for industrial and commercial applications.

The Hartig Extruder Division designs and manufactures machinery for extrusion of polyethylene, nylon, polyvinyl chloride, and other plastics.

Quaker Has New Pipe

After several years of intensive research and development, Quaker Rubber Division, H. K. Porter Co., Inc., Philadelphia, Pa., has made the first significant move in the history of the plastic pipe industry toward lowering the price of flexible plastic pipe, said the company.

Taking advantage of savings made possible through the use of an exclusive patented process, Quaker has lowered the cost of polyethylene pipe without sacrificing wall thickness, pipe weight, or burst strength. By adding a pure white polyethylene core, the pipe also takes on excellent eye appeal yet unmatched by other manufacturers, it was reported. Also for the first time, users of this type of pipe are assured of hospital clean, antiseptic white conditions for conveying water or other liquids for human consumption.

Regular polyethylene pipe has excellent corrosive resistance to any-type water. Quaker's new white core pipe is said to guarantee non-toxic conditions by using a 100% virgin core material without the addition of carbon black in its Porter Puritan White Core polyethylene plastic pipe.

Specifications for Puritan White Core, Porter 200 and Porter 201 polyethylene plastic pipe—weight, size, working pressure, and coil lengths—are available in a new four-page brochure available from the company.

Moplen in 19 Colors

Moplen polypropylenes are now available in 19 different colors plus natural in truckload quantities, according to Chemore Corp., New York, N. Y., general representative in the United States and Canada for Montecatini Soc. Gen., Milan, Italy.

Price per pound for natural resin is 56¢ in truckload quantities; standard colors are 65¢ per pound. Among the colors are flame red, sky blue, turquoise, and green, which are now available in this country in stock, and the following other standard colors available upon request—white, ivory, cream, yellow, pink, red, grey-green, light blue, ultramarine, slate blue, blue, Nile green, tan, grey, and dark grey.

Moplen is currently available in pellet form for injection molding and extrusion. Specially formulated compounds can be obtained for other applications. For further information regarding Moplen and for technical assistance on its use write Chemore Corp.

Magnetic Materials Plant

A new million-dollar plant to meet the needs of the rapidly developing industries of Brazil and other South American countries for basic magnetic materials and equipment in the fields of electronics, communications, steel processing and fabricating, chemicals, and others was inaugurated in Sao Paulo, Brazil, on May 22.

The plant, known as Eriez S.A. Productos Magneticos e Metalurgicos, is owned jointly by W. R. Grace & Co., New York, N. Y., and Eriez S.A., Erie, Pa., and Panama City, Panama. R. F. Merwin, Eriez president, and J. T. Whitely, Grace executive vice president, headed U. S. delegations at the inauguration ceremonies.

The Sao Paulo plant is the first basic magnetic materials and equipment supplier to be in any of the Latin American countries.

Full-scale production will begin immediately of permanent magnet castings and magnetic separation and automation equipment in sufficient quantities to supply projected requirements of Brazil and other South American nations.

Polymer's Latex Plant

The opening of a new latex handling plant recently was announced by Polymer Corp., Ltd., Sarnia, Ont., Canada. The new plant has been under construction since 1957. Of steel, red brick, and transite, the unit was designed by Giffels & Vallet and constructed by Curran & Herridge and Polymer construction department at a cost $1.9 million. Built to a height to take advantage of gravity flow, its design includes resin-lined tanks and glass piping throughout the latex handling systems to reduce fouling and plugging of lines.

Individual latex systems eliminate the possibility of contamination, thus insuring a high standard of product cleanliness and uniformity. Up-to-date loading and weighing facilities handle shipments of all kinds from 45-gallon drums to highway tank trucks and railway cars. A special railroad spur is laid into the building to permit tank-car loading to be carried on indoors.

In addition to the already existing types of latex, Polymer's new plant is producing a new Polysar product—Polysar Latex 721—primarily for manufacturing foam rubber. The marketing of Polysar Latex 721 marks the first production of this type of latex in Canada.

A significant increase in the applications of synthetic rubber latex has occurred in the past few years. World demand for foam rubber latex has more than tripled since 1953.

Improved Teflon Parts

Complete facilities for the design, the compounding, and the molding of packings, gaskets, bearings, square rings, and other component parts made of reinforced Teflon,[1] tetrafluoroethylene resin, are now in operation at the special elastomers plant of the Chicago Rawhide Mfg. Co., Chicago, Ill.

The extreme versatility of Teflon through its chemical, thermal, and mechanical properties is said to make it unmatched by any other material. Even these properties may be distinctly improved, however, by the use of reinforcing inorganic additives. Teflon blended with inorganics is said to increase: resistance to deformation under load; resistance to wear by rotating shafts; stiffness; thermal conductivity; compressive strength; and hardness.

Chicago Rawhide Mfg. Co. is one of the few fabricators who blend their own Teflon compounds, thus assuring constant quality.

A four-page illustrated bulletin, "Sirvene Materials Bulletin CT-1," describing many of the chemical, thermal, mechanical, and frictional advantages of Teflon and reinforced Teflon parts is available from the company.

[1] E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

Hardy New RMA Secretary

Clifford S. Hardy has joined The Rubber Manufacturers Association, Inc., as secretary of the Mechanical Rubber Goods Division. Mr. Hardy is assuming some of the duties of the late J. J. Catterall, former secretary of this RMA Division, who died unexpectedly in January.

Mr. Hardy is a graduate of the University of South Carolina. He also attended Davidson College. He was executive secretary for The Carolinas Ginners Association, Inc., from 1952 to 1956, and executive vice president of the National Cotton Ginners Association from 1954 to 1956. His most recent position before joining the RMA was director of public relations for Holiday Inns of America, Inc.

Mr. Hardy has been a columnist for the *Cotton Trade Journal* and cosponsored the first Southeastern Gin Suppliers Exhibit held in Atlanta, Ga., in 1955 and 1956. A member of the American Society of Association Executives, United States Chamber of Commerce, American Legion, Pi Kappa Phi, and the Memphis Press Club, Mr. Hardy resides with his wife and family in New York, N. Y.

Clifford S. Hardy

Phillips Chemical Staff And Office Changes

Several changes have been announced in the rubber chemicals division of Phillips Chemical Co., wholly owned subsidiary of Phillips Petroleum Co., Bartlesville, Okla.

At Akron, O., J. A. MacKay has been promoted to the newly created position of assistant manager of domestic sales, under George E. Popp, manager, while Frank W. Burger has succeeded MacKay as sales manager of the central district, also located in Akron. Warren S. Hall has been named manager of sales development with headquarters in Akron, and James A. Millar has joined the staff as technical sales representative. Clifford Abbott is now manager of the Akron laboratory, and Howard J. Hugus has been added to the laboratory staff.

C. H. Edwards, Jr., has been transferred to Dallas, Tex., as a technical sales representative, and George D. Covington has succeeded Burger as technical sales representative at Providence, R. I. Daniel Farynyk has joined the Chicago office staff as technical sales representative.

It was also announced that the rubber chemicals division has opened a new office at Limmatquai 70, Zurich 1, Switzerland, to serve European customers in the synthetic rubber and carbon black fields.

Jan Willums, who has been in Zurich as European manager of the Phillips rubber chemicals division since 1954, is in charge of the new office. He joined Phillips in 1948 as technical representative in Copenhagen, Denmark. He studied chemical engineering in Norway and received a degree in industrial engineering from the University of Akron, Akron, O.

Agmund Thorsrud, European technical representative, joined Phillips in October, 1957, to assist Willums. He is a graduate of the State University of Technology at Trondheim, Norway, and spent two years at the French Rubber Institute in Paris, France. He is a former director of research and development at the Central Laboratories of A/S Askim Gummivarefabrik of Norway.

The cable address of Phillips new office is Philkemic, Zurich.

Frank W. Burger

John A. MacKay

NBS Adds Two More Standard Samples

The National Bureau of Standards, Washington, D. C., has added two new standard samples to its list of materials for rubber compounding. They are Standard Sample No. 383, mercaptobenzothiazole, and No. 385, natural rubber. A total of 17 reference standards, including vulcanizing agents, accelerators, fillers, and other compounding ingredients, is now available for use in the quality control of rubber raw materials and rubber production.

The new standards represent the culmination of work started in 1927. At that time a program was started by the Division of Rubber Chemistry of the American Chemical Society, and The Rubber Manufacturers Association, Inc., to develop methods for evaluating plantation rubber. The standard formula and procedures which are used today for preparing test vulcanizates of natural rubber resulted from that early effort.

When studies to improve natural rubber testing were resumed at the Bureau in 1948, it was recognized that a standard sample was needed as a yardstick for standardization of testing in rubber laboratories throughout the world. Standard Sample No. 385 fills this requirement. With the establishment of Standard Sample No. 383, the list of compounding ingredients needed to test natural rubber is complete.

These two new materials also complete the standard samples required for preparing the standard natural rubber compounds of the American Society for Testing Materials[1]. The 17 standard samples with their prices and weights are listed in a table available from the National Bureau of Standards.

[1]See ASTM Designation D 15-57T, American Society for Testing Materials, Philadelphia, Pa.

NEWS BRIEFS

Goodrich-Gulf Chemicals, Inc., Cleveland, O., will construct additional facilities at its Port Neches, Tex., SBR plant for the manufacture of carbon black masterbatch rubbers. The new facilities will cost in excess of $1 million and are designed to produce a new type of dry synthetic rubber containing carbon black. The plant will employ a new process which has been developed in large-scale pilot-plant operations over the past year and will provide tire manufacturers with a line of high-quality, abrasive-resistant products said to be superior to those now available.

St. Joseph Lead Co., New York, N. Y., has appointed Harwick Standard Chemical Co., Akron, O., sales representative for St. Joe lead-free zinc oxides in the states of Georgia, North and South Carolina, and eastern Tennessee. Sales contacts in these areas will be made by A. Koper and A. Groce, from the Harwick branch offices in Albertville, Ala., and Greenville, S. C. Carload shipments will continue to be made directly from Josephtown, Pa.; less-than-carload stocks will be maintained at Greenville. S. C.

Allis-Chalmers Mfg. Co., Milwaukee, Wis., has announced that all directors of the firm were reelected at the annual meeting of shareholders held May 7. Directors reelected were F. Bohen, W. C. and W. E. Buchanan, H. M. Comer, J. D. Cunningham, D. A. Forward, E. Mahler, L. Quarles, B. S. Oberlink, W. G. Scholl, J. L. Singleton, and R. S. Stevenson. Officers reelected were R. S. Stevenson, president; W. G. Scholl, executive vice president; B. S. Oberlink and J. L. Singleton, group vice presidents; and W. A. Yost, Jr., vice president-staff operations.

Military Clothing & Textile Supply Agency, Philadelphia Quartermaster Depot, U. S. Army, Philadelphia, Pa., has made an award on invitation for bids QM 36-243-58-697, covering gloves, rubber, men's, acid-alkali resistant, gauntlet cuff. The award went to The Pioneer Rubber Co., Willard, O., for 63,216 pairs at a price range from $1.035 to $1.125 for a total dollar value of $67,703.86. This procurement is for the U. S. Navy.

The Goodyear Tire & Rubber Co.'s R. P. Dinsmore, vice president in charge of research and development, addressed the Association of Canadian Advertisers at Toronto, Ont., Canada, on "New Products—A Must for Successful Marketing," May 6. Approximately 600 senior sales and advertising executives of major Canadian companies heard Dr. Dinsmore cite numerous examples of how new product developments contribute to the growth and the success of any marketing program. New products, he said, result from constant analysis of market needs combined with foresighted research and development. The reputation of a business firm is an important key to its ability to gain and hold customers. The reputable company, he continued, is honest with its customers, jealous of its product quality, and stands behind any fault or mistake that reduces the performance which normally can be expected. Only a satisfied buyer, he emphasized, will buy again and again from the same supplier.

Petro-Tex Chemical Corp., Houston, Tex., has announced that construction has begun on a high-purity isobutylene plant. The product will be above 99% purity, according to the firm, and will be available in pressure-type tank cars in December of this year. The capacity of the plant will be large enough to supply a substantial part of the present market for isobutylene. Currently a major supplier of butadiene and other olefins, Petro-Tex is jointly owned by Tennessee Gas Transmission Co. and Food Machinery & Chemical Corp.

Chippewa Plastics Inc., Chippewa Falls, Wis., is producing commercially industrial shipping bags fabricated from 10-mil polyethylene film. The company's announcement came on the heels of a recent action by the Railroad Joint Classification Committee approving such bags for domestic rail shipments of plastics materials. Monsanto Chemical Co. and other bag users working closely with Chippewa have demonstrated the broad usefulness of polyethylene bags by shipping such diversified products as polyethylene resins and compounds, ammonium nitrate, carbon black, sodium bisulfate, and seeds. Shipments of many other products are being evaluated.

The Dayton Rubber Co., Dayton, O., has signed an option on a 62-acre site in Springfield, Mo., where it plans to construct a mechanical rubber goods manufacturing plant. The new site is a half-mile long by a quarter-mile wide. The new one-story brick and concrete plant will house approximately 175,000 square feet in the manufacturing area. The plant will employ several hundred people initially. The particular location of this new facility was chosen after the company checked for one with an adequate supply of cooling water with a minimum of hardness and good transportation facilities.

Monsanto Chemical Co.'s plastics division is installing additional facilities to produce Lytron 680, an acrylic-type binder for latex paints, at Springfield, Mass. Scheduled for completion this month, the expansion will double present production capacity. The Monsanto latex was introduced to paint manufacturers in October, 1956, when the company reported the results of an 18-month program of outdoor field testing. Since these exposure tests were begun, a number of manufacturers have adopted Lytron 680 for exterior paint formulations.

Goodyear Aircraft Corp., Akron, O., has added a new member to its Inflatoplane series, a 205-pound junior-size collapsible aircraft built for the United States Army. It made its first public appearance during Armed Forces Day observances, May 10-11, at Andrews Air Force Base, Washington, D. C. The new one-place Inflatoplane is an improved version of the GA-447, recently built and flight tested by Goodyear Aircraft for the Office of Naval Research. The Army has procured five of the models, as has the Navy, for field evaluation. Only seven pounds of air pressure per square inch are required to inflate the plane. Air pressure is maintained by a continuously driven engine-mounted compressor, even when the fuselage is riddled by bullets. The Inflatoplane's airframe has a payload capacity of 240 pounds, plus fuel for seven hours of flight. Stall speeds of 41 mph., cruise speeds of 60 mph., and maximum speeds of 72 mph. can be obtained with the craft's 42-hp. Nelson engine at altitudes up to 8,000 feet.

Seiberling Rubber Co., Akron, O., is entering the small-car tire market. This month Seiberling tires will be available for most makes of sports cars and other small automobiles. Its premium-brand safety tires will be available in both black and white sidewall, in tubeless construction and in several sizes. All will be for the replacement market. Sizes to be offered are 5.20-13, 5.60-13, 5.90-13 and 6.40-13, and 5.00/5.25/5.60-15, 5.50/5.90-15, and 6.00/6.40-15.

Copolymer Rubber & Chemical Corp., Baton Rouge, La, has announced plans for immediate plant-scale production of an SBR carbon black masterbatch. This type of production is a new venture for the company, which has been working on the development of this product on a laboratory, pilot-plant, and semi-commercial scale for some time. Tires made with this masterbatch have tread wear resistance believed to be superior to those produced by the conventional dry black mixing method. It was reported that $3 million has been allocated for construction of facilities for production of this product, named Carbomix. Actually, production has already begun on a small scale, but the new facilities are not scheduled for completion until November. Plant production capacity will be increased by 20% at that time.

The Goodyear Tire & Rubber Co.'s flooring products set an all-time sales mark during the first quarter of 1958, paced by the revolutionary new, economical vinyl floor tile, NoScrub. It was reported that Goodyear flooring sales jumped more than 16% over the previous first-quarter high recorded in 1953 and finished 25% ahead of the same period in 1957. Greatest gain was in vinyl sales, it was stated. Vinyl flooring sales soared more than 40% over the initial quarter of 1957 and were 25% ahead of the previous peak, also reached in 1953. The flooring production units are working 24 hours a day, seven days a week.

Dewey & Almy Co., Division of W. R. Grace & Co., Cambridge, Mass., plans to build a $4-million organic chemicals and battery separator plant at Owensboro, Ky. The plant is expected to more than double the division's capacity for vinyl acetate polymers and copolymers for paints, adhesives, paper coatings, and textile sizing, and styrene-butadiene copolymer latices for paints, paper coatings, rug backing, fabrics, and foam rubber. The battery separators to be produced are resin-impregnated fiber insulators inserted between the lead plates of automotive storage batteries. Construction on a 143-acre tract bordering the Ohio River started in May. The plant is expected to begin operations early in 1959.

American Alcolac Corp., Baltimore, Md., has introduced a new series of amine catalysts for urethane foam manufacture. The new products, to be sold under the Sipene trade mark, are long-chain fatty tertiary amines which produce urethane foams with good physical properties including low compression set values. These catalysts are characterized by high activity (more than 95% tertiary amine), high purity, and the absence or low level of odor.

Wallace & Tiernan Inc., Harchem Division, Belleville, N. J., has announced a price reduction for sebacic acid, effective April 28. The new prices are as follows: sebacic acid, purified, 6.55¢/lb.; dimethyl sebacate, $1.28/lb.; dibutyl sebacate, CP, 6.55¢/lb.; dioctyl sebacate, 5.925¢/lb.; dihexyl sebacate, 6.4¢/lb.; and dibenzyl sebacate, 9.1¢/lb. The reason for the reduction is a decrease in the cost of basic raw materials.

The General Tire & Rubber Co., Akron, O, is now offering for the first time nylon cord construction in a standard line of General truck tires, Traction Rib Special Service. This tire in nylon will retail at about 10% above the rayon-constructed model, it was reported. It will have greater tire body strength and should turn in many more recap miles. For truck, tractor, and trailer use, the tire is available in twin-bead sizes. It is being made in both nylon and rayon construction at the company's Akron, O., and Waco, Tex., tire plants.

The Appleton Machine Co., Appleton, Wis., has acquired Doven Machine & Engineering, Inc., Chicago, Ill. Doven is a long-time builder of specialty slitting and rewinding equipment for the rubber industry, the only manufacturer of its kind west of the Alleghenies. The plant will be moved to Appleton and operated under Eugene Doven, vice president, as the Doven division of Appleton Machine Co. The addition of the new division is part of Appleton Machine's expansion program, enabling the company to expand its line to include specialty slitters and rewinders. This product diversification permits the company to enter a number of new markets: paper converting, packaging, plastic, textile, rubber, and electrical insulation.

The Firestone Tire & Rubber Co., Akron, O., has announced that employes in its plants throughout the country will have an opportunity to have their cars inspected for safety in company-sponsored check lanes during May. With this program, Firestone becomes the first business or industrial concern to conduct a nation-wide safety-check for employes in conjunction with the national voluntary Vehicle Safety-Check for Communities sponsored annually by the Inter-Industry Highway Safety Committee and *Look* magazine.

American Latex Products Corp., Hawthorne, Calif., wholly owned subsidiary of Dayton Rubber Co., is developing a new series of solid, molded urethane elastomers for silent gears, gaskets and seals, printers' rollers, footwear, pump impellers, automobile and aircraft parts.

The B. F. Goodrich Co., Akron, O., plans to spend $35 million for capital expenditures and investment in 1958 as an expression of confidence in the future. It was reported that this sum is almost as much as the company's 1957 expansion of $38,871,000. The company reported that a decline of 11.8% in sales and narrower profit margins during the first three months of 1958 resulted in 38% lower earnings compared to the same period in 1957, but Goodrich expressed confidence that growth will be resumed in the United States with the upturn of the present economic adjustment. Company officials said Goodrich is laying plans and organizing for an important share in the long-term growth of the world economy.

Commodity Exchange, Inc., New York, N. Y., celebrated its twenty-fifth anniversary on May 1, with brief ceremonies held on the floor of the Exchange prior to the opening of trading. The Exchange came into existence as a legal entity on May 1, 1933, when the Rubber Exchange, New York Hide Exchange, National Metal Exchange, and the National Raw Silk Exchange were merged to assume identity as Commodity Exchange, Inc. Formal trading in future deliveries of crude rubber, raw silk, hides, silver, tin, and copper started in present Exchange quarters, 81 Broad St., New York, N. Y. on July 5, 1933.

Hummel Chemical Co., New York, N. Y., is marketing ammonium bicarbonate, a blowing agent for sponge. The following technical data on the compound are reported by the company: CO_2, 55.2—55.5%; NH_3, 21.3—22.1%; under 0.005% sublimation residue; under 0.005% Fe; said to be free of lumps and of tarry substances, lead, arsenic, sulfur, and sulfates; and satisfies all federal, state and municipal pure food laws and regulations. It is supplied in 100-pounds net polyethylene lined jute bags.

Parker Seal Co., division of Parker-Hannifin Corp., Cleveland, O., has developed a new Parker O-ring compound, Number 47-061, to meet requirements such as covered in military specification MIL-R-7362B. O-rings from this compound are for use in MIL-L-7808 oil and other diester synthetic oils. Temperature range is from —65 to +275° F.

Emery Industries, Inc., Cincinnati, O., has moved its New York sales office to new quarters at 1 Exchange Place, Jersey City, N. J. The new office will serve as headquarters for H. D. Armitage, R. J. Roberts, and R. C. DeLollis, fatty acid sales representatives, and G. R. Williams and R. S. Haley, organic chemical sales representatives.

News Briefs

Thiokol Chemical Corp.'s reaction motors division, Denville, N. J., is developing and producing the rocket engine for the Navy's new air-to-surface missile, the Corvus. The powerplant package will be delivered under a multimillion dollar subcontract with Temco Aircraft Corp., Dallas, Tex., holder of the prime contract for development of the Corvus.

The Goodyear Tire & Rubber Co., Akron, O., has produced an anti-icing protection system for use on empennage assemblies of the Boeing 707 Jetliner which has successfully passed weather tests conducted by Boeing Aircraft Co. Goodyear's aviation products division is engaged in quantity production of ice protection boots for the 707's vertical fin and horizontal stabilizers. Iceguards are composed of heating elements embedded in rubber with stainless-steel outer covers. When turned on by the pilot, the system automatically distributes electrical power to the heating units. Once its undersurface has melted, ice is lifted away from the plane's surface by action of the airstream.

Imperial Chemical Industries' heavy organic chemicals division is building a new plant at Billingham, Co. Durham, England, for the extended production of octylphenol and other alkylated phenols. For many years I.C.I. has manufactured octylphenol, and important raw material for the manufacture of lubricating oil additives, detergents, paint resins, and rubber chemicals. Para octylphenol is distributed in Canada exclusively by the chemicals division of Canadian Industries, Ltd., Montreal, P.Q.

The General Tire & Rubber Co. dedicated a new $1-million giant tire retread plant in East Rutherford, N. J., on May 14. Said to be the first operation of its kind in the East, the new plant was specifically built and located in the thriving industrial area of New Jersey to service the needs of contractors engaged to build roads under the Federal Aid Highway Program. Of the 85,000 square feet in the plant, 65,000 square feet are devoted to the storage and central distribution of all sizes of General tires to supply the needs of dealers in New Jersey, New York, Connecticut, and Pennsylvania. The remaining footage is devoted to the Kraft process of recapping tires, an exclusive General Tire patented process. This area is divided into recapping sections for giant off-the-road tires used in road construction work, taxi fleet, passenger and truck tires.

Sindar Corp., manufacturer of fungicides and antioxidants, has moved its offices from 330 W. 42nd St. to 321 W. 44th St., New York 36, N. Y.

Canadian Industries, Ltd., Hamilton, Ont. Canada, opened its new hydrogen peroxide plant on April 30, with the Honorable Ray Cornell, vice chairman of the Ontario Hydro Power Commission, officiating. The opening, attended by more than 100 businessmen and industrial executives, included a tour of the plant followed by a reception and luncheon. Officials of the Becco chemicals division of the Food Machinery & Chemical Corp., Buffalo, N. Y., whose process is being used at the plant also were in attendance.

Charleston Rubber Co., Charleston, S. C., has been awarded a contract by the Military Clothing & Textile Supply Agency, Philadelphia Quartermaster Depot, U. S. Army, Philadelphia, Pa., on invitation for bids QM 36-243-58-516, covering gloves, rubber, men's, SMV, gauntlet cuff. The contract was for 14,299 pairs, at $5.125 each, for a total dollar value of $72,923.63. This procurement was for the U. S. Navy.

United States Rubber Co., New York, N. Y., has manufactured what is said to be the largest green rubber circus mat ever made. It was used on the floor of the St. Louis, Mo., Arena when the St. Louis Police Relief Association held its annual event on April 24-May 4. Consisting of 170 sections, the matting was shipped to St. Louis from the company's Passaic, N. J., plant. Assembled over the Arena floor, the mats totaled more than 20,000 square feet.

Armour & Co., Alliance, O., has developed a No-Load finishing paper which can be used to sand molded rubber products during the light sanding-finishing operation. Unlike ordinary finishing paper, this new paper can be used dry instead of wet. It is said to provide a better finish than waterproof paper and will last longer and cut faster. It is available in a wide range of abrasive grits in crystolon, heat treated garnet, and garalun product.

NEWS about PEOPLE

F. L. Dawes, president and general manager of Adamson United Co., Akron, O., also was elected a director of United Engineering & Foundry Co., Pittsburgh, Pa., at the firm's recent annual meeting. Adamson United, a wholly owned subsidiary of United Engineering, builds machinery for the rubber, plastics, and associated industries.

Paul Coste recently retired from active service with The B. F. Goodrich Co. where he had been Mid-Atlantic district sales manager for flooring products. He has been appointed regional administrator of the new regional office of the Housing & Home Finance Agency in Puerto Rico and the Virgin Islands. He will be responsible for coordinating activities of five housing agencies. His headquarters are in San Juan, Puerto Rico.

George H. Potter and **Alton H. Wallace** recently joined the development department of Union Carbide Chemicals Co., division of Union Carbide Corp., at South Charleston, W. Va.

John Q. Shaul, former superintendent of The Goodyear Tire & Rubber Co.'s Akron Plant 2 tires, has been named director of production for Goodyear-Great Britain. He replaces **Howard L. Ginaven,** formerly of Akron, who returns here to become superintendent of Plant 2. Also, **Richard E. Ward** has been appointed manager of plant engineering and maintenance at the Goodyear plant in Wolverhampton, England. He had been division foreman of Goodyear's Akron Plant 1 maintenance and machine installation. In his new post, Shaul will be responsible for production at Goodyear's plants in Wolverhampton, Wallasey, and Glasgow, Scotland, with headquarters in Wolverhampton. He has been with the company since 1936, graduating from the training squadron in 1942.

Charles F. Blaich, Jr., has joined the sales department of The Carwin Co., North Haven, Conn., as technical representative, responsible for sale and market development of the firm's growing line of special isocyanates and other chemicals for use in polymer manufacture.

William E. Rider has been appointed director of public relations of the American Rayon Institute, Inc., New York, N. Y. He will be responsible for all phases of the Institute's public relations activities, with particular emphasis on the expanding field of high-tenacity rayon tire cord. He formerly handled public relations activities for American Cyanamid Co.

John B. Townsend has been named sales representative for the Acme and Hamilton Rubber Mfg. divisions of Acme-Hamilton Mfg. Corp., Trenton, N. J. His territory comprises Maine, Vermont, New Hampshire, Massachusetts, and Rhode Island. The corporation's products, industrial rubber hose, conveyor belting and packing, are sold through industrial supply distributors.

A. C. Groce

A. C. Groce, a new representative to the sale staff of Harwick Standard Chemical Co., Akron, O., will handle the company's accounts in the southeastern section of the United States. He will have his headquarters in Greenville, S. C., where the company will also have warehouse facilities.

Joseph P. Piers has been named to head the production department at B. F. Goodrich Chemical Co.'s new general chemicals plant in Henry, Ill. Previously Piers had served as general foreman in the rubber chemicals section of the company's Akron, O., chemical plant.

A. A. Garthwaite, chairman of the board of Lee Rubber & Tire Corp., Conshohocken, Pa., was reelected to his sixteenth one-year term as a board member of the National Industrial Conference Board at the Board's 385th meeting held recently in the Ambassador Hotel, New York, N. Y.

Fabian Bachrach

Lyle L. Shepard

Lyle L. Shepard has been elected president of Columbian Carbon Co., New York, N. Y. He succeeds **Carl E. Kayser** as chief executive officer. Kayser has been elected chairman of the board, a position which has been vacant since 1956.

Edward D. Hanagan has been named controller of Oakite Products, Inc., New York, N. Y., manufacturer of industrial cleaning and metal treatment materials.

Thomas L. Denney has been named general sales manager of The Garlock Packing Co., Palmyra, N. Y. He formerly was special assistant to the vice president-marketing. In his new post Denney will be charged with the administration, direction, and control of field sales efforts, supervision of district managers, and the coordination of sales activities between branch offices. Garlock is one of the world's largest manufacturers of packings and seals.

Austin Goodyear, executive vice president of Hewitt-Robins, Inc., Stamford, Conn., has been elected president of the company, succeeding **Thomas Robins, Jr.,** who has held the dual positions of chairman of the board and president. Robins will continue as chairman of the board and chief executive officer. Goodyear started with Hewitt-Robins in 1941 in the manufacturing department of the company's Passaic, N. J., plant. He was appointed production manager in 1947, then was transferred from production to sales in 1948 as assistant to the vice president in charge of sales. He was elected to the board of directors in 1952 and a vice president in 1953, followed by promotion to executive vice president in 1955.

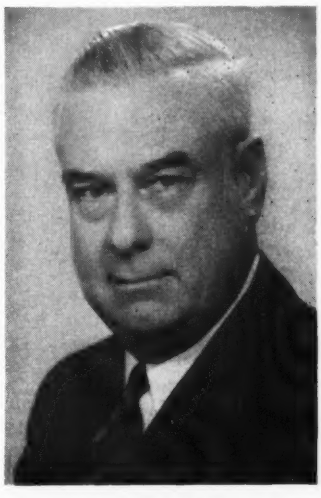
Maurice H. Bigelow has been appointed vice president of Barrett Division, Allied Chemical Corp., New York, N. Y. Formerly technical director, Dr. Bigelow will continue to be head of Barrett's research and development department and will be located in the New York office.

Orville W. Taylor has been assigned as senior engineer at the B. F. Goodrich Chemical Co.'s general chemical plant at Henry, Ill. Taylor, who will report to the plant engineer, moves to his new assignment from the Calvert City, Ky., plant of BFG Chemical.

William J. Fritton, marketing vice president, U. S. Rubber Reclaiming Co., Inc., Buffalo, N. Y., was elected to the board of directors at the company's annual stockholders' meeting. He joined the company in 1956 and was elected vice president in April, 1957.

Anton Liebscher has been appointed general manager of Wellco Shoe (Jamaica) Ltd., Kingston, Jamaica, B. W. I., where a most modern factory is already completed and is now being installed with its new equipment.

F. Russell Valpey has been elected president of The Standard Products Co., Cleveland, O. He joined the firm in 1940 as Washington representative and most recently was senior vice president and chairman of the management policy committee. Other positions in which he has served include secretary of the company, manager of the Port Clinton (Ohio) division, general manager, and vice president. **J. S. Reid,** founder of the company, who has been serving both as chairman of the board and president, will continue as chairman and chief executive officer of the large automotive parts firm.



F. Russell Valpey

Artists Inc.

C. K. McMillen

Artists Inc.

S. A. Davis

Lubitsh & Bungarz

Lyle E. King

Samuel A. Davis has been elected president of The C. P. Hall Co. of Illinois, Chicago, Ill., and **Chester K. McMillen** was elected to the position of vice president vacated by Davis. Davis first joined the C. P. Hall Co. in 1923 and in 1939 moved to Chicago to help organize The C. P. Hall Co. of Illinois. McMillen has been associated with the latter company since 1946 and was made assistant secretary and treasurer in 1953.

Salvatore Piccione has joined the research and development department, Pittsburgh Coke & Chemical Co., Pittsburgh, Pa. A physical chemist, Dr. Piccione will be assigned to the analytical and physical research section of the department. Prior to joining Picco, he served as a research chemist in Canada with both General Electric Corp., Ltd., and Aluminum, Ltd.

R. W. Ott, Jr., has been made vice president-sales, Fife Mfg. Co., Inc., Oklahoma City, Okla. With headquarters in Milwaukee, Wis., he will provide sales and technical service to accounts in the Midwest for Fife, a major supplier of all types of automatic web guide equipment.

Frederick W. Gage has been appointed vice president, Dayton Chemical Products Laboratories Inc., West Alexandria, O. Also announced was the appointment of **Lyle E. Calkins** as assistant secretary. Gage joined the firm in 1954 as technical director, having been a research supervisor with Columbia Southern Chemical Corp. for a number of years. Calkins, at one time chief chemist for Willys Motors, Inc., Toledo, O., and later with Champion Textile Finishing Co., Chicago, Ill., came to Dayton Chemical as chief chemist in early 1957.

H. Logan Lawrence

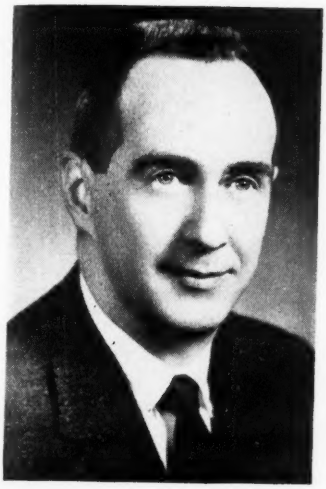
Frederick W. Gage

H. Logan Lawrence has been named assistant director of sales, elastomer chemicals department, E. I. du Pont de Nemours & Co., Inc., Wilmington, Del. He succeeds **Milton H. Campbell,** who was transferred to the company's international department. Also, **Lyle E. King** was named product sales manager for elastomers, the position previously held by Lawrence.

Everett E. Klicker has become market research manager, Michigan Chemical Corp., St. Louis, Mich. He will assist **H. Stanley Lawton,** vice president of sales and development, in extending the markets for the company's basic chemicals and their derivatives.

Earl F. Miller has been named manager of the General Tire & Rubber Co.'s Ashtabula, O., chemical plant. **P. J. Wallace,** former Ashtabula plant manager, has been appointed production manager of the company's new synthetic rubber facility at Odessa, Tex. Miller has had extensive manufacturing experience, having specialized in the technical administrative field. Prior to joining General's manufacturing analysis department in Akron, O., he was executive assistant to the president of Sheller Mfg. Corp.

Earl W. Wilson has been made maintenance foreman of B. F. Goodrich Chemical Co.'s general chemicals plant in Henry, Ill. He moves to his new post from the Cleveland main office, where he has been an electrical engineer in the design section. **Charles D. McCrosky** and **Allen W. Otto** have been assigned as technical men and will act as shift foremen in the laboratory facilities of the Henry, Ill., plant. Both are currently employed at the Akron, O., chemical plant of BFG Chemical.



James F. Pflum

James F. Pflum has been named manager of the newly created sales service engineering department of Pennsylvania Industrial Chemical Corp., Clairton, Pa. The department was created for the design and the development of mechanical methods and equipment which will enable customers best to receive, store, transfer, process, and use any of the firm's products.

Arthur P. Kroeger, associate director of marketing for the organic chemicals division, Monsanto Chemical Co., St. Louis, Mo., has been appointed director of marketing for the division. He succeeds **John L. Hammer, Jr.,** who has resigned from Monsanto to accept appointment as assistant to the president of Mississippi Lime Co.

Robert G. Colvin, treasurer, Kirkhill Rubber Co., Brea, Calif., has been elected to membership in the Controllers Institute of America, New York, N. Y.

Grant C. Rickard has joined the Copolymer Rubber & Chemical Corp., Baton Rouge, La., as sales representative servicing the southern and southeastern states, with headquarters in Atlanta, Ga.

R. C. Waller has been advanced to manager, plastics research; **V. J. Anhorn** to manager, organic chemicals processing; **S. D. Gehman** to manager, physics research; and **F. J. Young** to manager, process engineering, all in the research division of The Goodyear Tire & Rubber Co., Akron, O. Waller and Anhorn will report to **A. M. Clifford,** manager of chemicals and plastic research; while Gehman and Young will report to **W. H. Nicol,** manager, physics and engineering research.

William P. Kelley

Arthur P. Kroeger

Grant C. Rickard

Hamilton Ruth

Hamilton Ruth has joined the sales force of the rubber division of J. M. Huber Corp.'s industrial products department and will be associated with the Akron, O., office which handles the sales of carbon blacks, clays, and chemicals to the rubber industry in Ohio and eastern Michigan.

William P. Kelley has been appointed to the new position of manager, molded and extruded sales, The Ohio Rubber Co., a division of Eagle-Picher Co., Willoughby, O. Before going to Ohio Rubber he was with KITCO Engineering & Mfg. Co., Bluffton, Ind., where he was vice president in charge of sales and a cofounder of the company. Previous to that he had been automotive sales and engineering representative for United States Rubber Co., mechanical goods division.

Harry Gerstin, vice president in charge of the rigid plastics division, will supervise facilities at the new Freedlander Research & Development Center of Dayton Rubber Co. and its wholly owned subsidiary, American Latex Products Corp., Hawthorne, Calif. **Sam Chess** will supervise research activities.

Ralph I. Dunlop has been appointed to the newly established position of production technical service manager for eastern operations of Monsanto Chemical Co.'s plastics division, Springfield, Mass. Dr. Dunlop will be in charge of the technical groups which develop ways to improve the efficiency and safety of the manufacturing processes at the division's plant. **Cecil E. Johnson** has been appointed assistant research director in charge of planning, personnel, and control functions; while **Robert R.. Lawrence** has been promoted to manager of planning, succeeding Johnson.

Donn Snyder

John F. Stiff

Donn Snyder, formerly of the Boston sales office of Columbian Carbon Co., has been transferred to the principal office of the company, 380 Madison Ave., New York, N. Y., as assistant to the sales manager. **Thomas E. Weaver** joins the company to replace Snyder. His headquarters are in the Park Square Bldg., Boston, Mass. **John F. Stiff,** manager of Columbian's Detroit, Mich., sales office, has been transferred to the company's New York office as eastern district sales manager. **Edward I. Bosworth** moves from Columbian's Akron, O., office to become branch manager in Detroit, replacing Stiff.

Thomas E. Weaver

Edward I. Bosworth

Allan G. Davies has been named New York district sales manager, National Lead Co.'s Titanium Pigment Corp., New York, N. Y. He joined the corporation as a salesman in 1945 and until the present appointment had been a salesman in the San Francisco, Calif., area. **Henry E. Melvin** has been transferred from Los Angeles to San Francisco as senior salesman, in charge of the sales office in that city. He had been working in the Los Angeles area since 1947. **David A. Sonnenmair, Jr.,** a Titanium Pigment sales trainee in New York since July, 1957, is now a salesman in Los Angeles. He was first employed at the company's Baltimore, Md., branch in 1952.

Roy A. Smith has been appointed technical director of Gro-Cord Rubber Co., Lima, O., manufacturer of work and safety shoe soles and heels.

Lewis W. Lubenow has been appointed sales manager for the semi-bulk handling department of Delta Tank Mfg. Co., Inc.'s materials handling equipment division. He will headquarter at Delta's office in New York, N. Y. Delta, a wholly owned subsidiary of General Gas Corp., Baton Rouge, La., is a leading producer of pressure vessels and other heavy equipment for the petroleum, chemical, and petrochemical industries. Materials handling equipment includes a special type of weatherproof portable metal bin designed both for storage and shipment of granular or powdered materials. Mr. Lubenow has been active in both the materials handling and design engineering fields since 1939. Previously he had been with United States Rubber Co., with the Bakelite Corp., and with Farrel-Bimingham Co.

John E. Knight has been named north central area sales representative for the industrial products division, The Pioneer Rubber Co., Willard, O., makers of Stanzoil, Stanflex, Pacemaker, and Sheergrip industrial gloves. His territory will cover 10 states: Illinois, Indiana, Iowa, Kentucky, Minnesota, Missouri, Nebraska, North and South Dakota, and Wisconsin. Before joining Pioneer, he had worked in the same area in a similar capacity for The Hood Rubber Co.

Carl G. Link has been named eastern regional manager of the Boston Woven Hose & Rubber Co., division of American Biltrite Rubber Co., Boston, Mass. The eastern regional territory will include the areas from New York State to New Orleans, with headquarters in New York, N. Y.

Richard L. Engel has been appointed manager of Allis-Chalmers Industries Group Pacific Region. He was manager of the Group's Los Angeles district since 1953 and has been with Allis-Chalmers since 1939. **Donald E. Stelle** becomes manager of the Los Angeles district, succeeding Engel. Stelle was manager of petroleum and chemical sales at Los Angeles since 1956.

Donald L. McCuen has joined the industrial chemicals division, Pittsburgh Coke & Chemical Co., Pittsburgh, Pa., as a sales representative. He will handle sales of the company's industrial chemicals in the Philadelphia territory, succeeding **Walter H. Daub,** who returns to Pittsburgh on an assignment in the product development section of the industrial chemicals division. Prior to joining the company, McCuen was technical representative, polymer chemicals division, W. R. Grace & Co., and had been president of his own manufacturing firm, McCuen Products, Inc.

George W. Sadler has joined Columbia-Southern Chemical Corp. as a technical representative for its Boston, Mass., district sales office at 1256 Little Building. He recently completed an orientation program at the firm's Barberton, O., chemical producing plant.

News about People

William H. Jefferson and **William J. Watson,** both of General Latex & Chemical Corp.'s Ashland, O., plant, were recently promoted. Jefferson, general manager of the Ashland plant, will move to company headquarters at Cambridge, Mass., to assume the duties of assistant to the president. He served as district sales manager and general manager during his two-year tenure at Ashland. Watson will succeed Jefferson as general manager of the Ashland plant. During the past two years he served General Latex as sales representative in the Midwest. Also **C. R. Hunnell** and **Donald O'Connell** have joined the General Latex sales staff. Hunnell has been made the Minnesota Wisconsin, Illinois, Indiana, representative and will reside in the Chicago area. O'Connell will reside in Ashland and will act as sales representative in southern Ohio. southern Indiana, and Missouri.

James G. Park, vice president of Enjay Co., Inc., New York, N. Y., will retire July 1 after 38 years' service. He started as a sales trainee in 1920 and later spent three years in Brazil selling petrochemicals. Subsequently he was recalled to the New York headquarters and later promoted to sales manager of chemical products. He was named vice president in 1935.

Harry P. Hancock, Jr., has been made personnel manager of the Rubatex division, Great American Industries, Inc., Bedford, Va.

George Rieger has been appointed director of market research and development for Amoco Chemicals Corp., Chicago, Ill. This newly created position reflects the increasing activity of the company in diversifying its position in the chemical industry.

Maynard H. Patterson, Robert W. Mueller, and **Lyle H. Fisher** have been elected by the board of directors to the position of vice president, Minnesota Mining & Mfg. Co., St. Paul, Minn. The board also elected **Harold F. Larson** assistant treasurer of the company.

Harold A. Swanson, vice president, has been elected a director of Nopco Chemical Co., Harrison, N. J. He is in charge of sales and laboratories of the company's industrial and fine chemical divisions.

John E. McDonald has been named manager of tire service compounding, The Goodyear Tire & Rubber Co., Akron, O. For three years manager of quality control, tire and tube manufacture, prior to his present assignment, McDonald is able to draw on 28 years of experience in rubber compounding.

J. R. Lillar has been appointed to the position of assistant to the president; while **J. P. Sayre** has been named manager, purchasing and stores department, Polymer Corp., Ltd., Sarnia, Ont., Canada.

Raymond J. Mucci has been appointed assistant to the general manager of the Naugatuck Chemical Division, United States Rubber Co., New York, N. Y. Formerly a member of the Division's commercial development department, he will be engaged in general forecasting and business research assignments.

H. P. Schrank, executive vice president, Seiberling Rubber Co., Akron, O., has been elected to honorary membership in Beta Delta Psi, honorary fraternity in the College of Business Administration at the University of Akron. The membership was bestowed for outstanding service to business and industry, cooperation and contributions to management.

W. A. Taylor is now sales manager of the chemical division of Canadian Industries, Ltd., Montreal, P.Q., Canada. He succeeds **H. G. Campbell,** who has been assigned special duties in the office of the division's general manager.

Joseph L. Bearden has been named superintendent of B. F. Goodrich Industrial Products Co.'s consolidated Plants 1, 2, and 4, Akron, O. He succeeds **Lee D. Tidball,** who assumes responsibilities for special assignments, reporting to Clyde O. DeLong, president.

Charles O. Myatt, now technical service manager of Arizona Chemical Co., Inc., New York, N. Y., will have the responsibility of providing technical service and information to Arizona customers throughout the U. S. He will maintain headquarters at the company's laboratory at Linden, N. J.

George Mastel has been made controller, and **Craig S. Kirkpatrick** advertising manager and director of public relations for Minnesota Rubber Co., Minneapolis, Minn.

Arthur K. Walton, who for the past ten years has directed the tire buying operations of Sears, Roebuck & Co., Chicago, Ill., has been named vice president in charge of factories for Sears. He is a member of the board of directors of the Armstrong Rubber Co., West Haven, Conn., and the Armstrong Tire & Rubber Co., Natchez, Miss. He is also president and director of the Copolymer Rubber & Chemical Corp., Baton Rouge, La.

Quandt M. Adams has been named senior technical man at the new B. F. Goodrich Chemical Co. glacial acrylic acid plant in Calvert City, Ky. He previously worked on the development of the acrylic acid process at the company's development center in Avon Lake, O.

Gavin A. Taylor has been named manager of export sales-Europe for Enjay Co., Inc., New York, N. Y. In his new post he will spend the next six to eight months in Western Europe and North Africa.

Obituaries

Gabriel George Balazs

Gabriel George Balazs, technical superintendent at the Goodyear Tire & Rubber Co.'s Uitenhage, South Africa, plant, died suddenly May 12. Well-known throughout the Akron, O., area, he was in Akron last fall on regular home leave.

He had been with Goodyear since 1928, having joined the firm as a compounder. He was transferred to the California plant in 1931 and in 1938 went to England as chief chemist at the Wolverhampton plant. He returned to Akron in 1945 and in 1950 was assigned to the Goodyear plant in South Africa.

Mr. Balazs was born on May 31, 1903, in Kenosha, Wis. He was a graduate of the University of Wisconsin and was also a Goodyear Fellowship Student at the University of Akron in 1928.

Survivors include the widow, three sons, and two sisters.

Interment took place May 13 in Uitenhage.

Benjamin Wood

Benjamin Wood, executive director of the American Rayon Institute, Inc., New York, N. Y., died on May 20 as the result of an accidental fall from a train. The 60-year-old executive was enroute to Akron, O., when the accident occurred.

Mr. Wood joined ARI in 1953 following his association as vice president with Wm. Esty Co., Inc., New York, N. Y., an advertising agency. Prior to that he had been director of marketing for the Glass Container Manufacturers Institute and for 11 years had been managing director of the Tea Bureau, Inc., both of New York, N. Y.

He was born in Kansas City, Mo., and was graduated from the University

(Continued on page 488)

NEWS from ABROAD

France

Clay/NR Masterbatches

Of the various clays abounding in Indo-China, the siliceous clays containing more or less ferric hydrate and ranging in color from white to deep purple, are most suitable for compounding with rubber, and of these in turn, the red variety is the most interesting. Tests on plantations have revealed that as a reinforcing filler, the red clay is far superior to all kaolins presently employed, a superiority apparently due to its ferric hydroxide content and the fineness of its particles. Outstanding results are obtainable, however, only when the clay is used in the form of clay/rubber masterbatches.

To prepare these masterbatches, a stabilized dispersion of the "fines" of the clay, with pH 8, is produced by mechanical and chemical (ammonia) deflocculation followed by sedimentation; next, the clay dispersion is mixed with latex, and the whole coagulated and homogenized at the same time; the resulting mass of coagulum is then washed, creped, and dried. As a precautionary measure, an antioxidant may be added to prevent the action of possible harmful amounts of iron and manganese in the mixture.

The Rubber Research Institute of Vietnam prepares a red clay/rubber masterbatch 100 TL (containing 100 parts of clay to 100 parts of rubber) on a semi-commercial scale, which was used in a series of tests of mechanical properties at the Institute Francais du Caoutchouc;[1] at the same time an experimental compound containing 165 parts of red clay per 100 parts of rubber (165 TL) was studied. The mixes were prepared in the customary way when mineral fillers are used, except that the acid pH of the red clay was taken into account in choosing the accelerator. In the tests the combination of benzothiazyl disulfide (MBTS) and hexamethylene tetramine (found to give the best results) was employed. Vulcanization required no special measures.

While the presence of a high proportion of oxide of iron in the clay might suggest that the vulcanizates would be susceptible to oxidation, the experience has been that samples kept for five years have undergone no change; from this it is deduced that the iron is present in a particularly inactive form. Nevertheless, as a precaution, a protective agent was added; 1% of phenyl-beta-naphthylamine proved very satisfactory.

The vulcanizates were found to have a high tear resistance, low hysteresis and low heat build-up, and a remarkable resistance to abrasion. Tear resistance of 100 TL mixes was of the same order as with MPC blacks, slightly lower than for ultra-fine silica, but very markedly superior to that with chalk or ordinary clay. Tear values for 165 TL, though still high, were significantly lower than for 100 TL. This difference is thought to be due to a difference in the sedimentation of 100 TL and 165 TL suspensions. Tensile strength and modulus at 300% elongation of the 165 TL vulcanizates are on a level with those for an MPC black or an ultra-fine silica.

Abrasion resistance was first determined with the Du Pont-Grasselli machine. By this method, however, a pure gum mix appears superior to a carbon black mix; furthermore, the amount of material worn off, as found for a carbon black mix, is in no relation to actual normal wear of tires. Consequently a new machine and method developed at the IFC were used. It was found that the red clay mix seemed to be slghtly, but significantly superior to one with MPC black at a concentration corresponding to 28% by volume of rubber. These results have already been supported by preliminary tests of tires on the road, but will have to be confirmed by further thorough testing.

[1] *Rev. gén. caoutchouc*, July, 1957, p. 691.
[2] *Ibid.*, Nov., 1956, p. 973.
[3] *Ibid.*, Nov., 1957, p. 1122.

New Abrasion Methods

New methods for testing abrasion at the Institut Francais du Caoutchouc are the outcome of an extensive program of experimentation started about four years ago by the Institut and the Rubber Stichting, in collaboration, to determine the factors that affect tire abrasion tests and render interpretation of results difficult; use was made of the findings of other investigators. Many factors, such as position of tires on the vehicle, ambient temperature, climate, wet roads, speed, driver, type of road, as well as possible interactions, were studied with the aid of statistical methods. Tread compounds, with natural rubber, cold, SBR rubber, oil-extended SBR rubber, rubber-resin mixes, were used[2].

The most important result of this work proved to be the determination of a "test severity" factor, this being the absolute wear of a reference tire during a given experiment and covers all testing conditions. A close relation could be shown to exist between relative wear of the compounds used and the severity factor.

The fact that the conditions of laboratory testing are usually very severe suggested the extension of the notion "test severity" to laboratory tests with abrasion machines and the possibility of a correlation between results of these tests and tests conducted on road and track.

C. Prat[3] describes further work on correlation of laboratory and road tests carried out with the aid of a new machine designed by the IFC technical department, which permits wide variations of operating conditions and makes it possible to calculate the coefficients defining the regression line from the experimental data. Then by extrapolation to normal road conditions an estimate of the behavior of a given material can be made.

The variables of the machine are: (1) the load on the sample; (2) the angle of ths axes of rotation of the abrasion disk and the pulley; (3) traveling rate of the slide for the sample holder; (4) linear speed of the abrasion disk; (5) linear speed of the pulley.

By manipulating these different factors, the severity can be varied from a few cubic centimeters to more than 500 cm^3 per 100 km. traveled by the disk.

The method was used in studies on the preparation and behavior of new compounds, among others those containing rubber/red clay masterbatches. From the data obtained solely in the laboratory it was possible to plot the curves for relative wear in relation to the proportion of filler in the mix, for average severities on the machine, on track, and on the road.

Practical tests that have been designed to confirm the results of this work are now in progress.

UGINE Is Licensee

United States Rubber Co., New York, N. Y., U.S.A., has exclusively licensed a Paris chemical manufacturer (UGINE) to produce its Paracril oil-resistant synthetic rubbers and Kralastic high impact plastic materials in France.

Under terms of the agreement the rubber company licenses Société d'Electro-Chimie d'Electro-Metallurgie et des Acieries Electriques (UGINE)

under patents it holds in France. U. S. Rubber will also provide technical assistance for the construction and operation of a plant to produce acrylonitrile butadiene-styrene copolymers and nitrile, oil-resistant synthetic rubbers.

UGINE, a major French company, has been a producer of specialty steel alloys and electro chemicals for many years. Since World War II it has expanded into organic chemicals. Adding the new materials to its commodity line will make it one of France's principal suppliers for specialty synthetic rubbers and high impact plastics.

Until the present time, specialty synthetic rubbers, latices, and acrylonitrile butadiene-styrene plastic resins were imported into France from the United States and Canada.

Substantial demand for both these new materials already exists in France. French plastic molders are already using the company's Kralastic plastic resins for automotive parts, pipe, and houseware articles. Paracril nitrile rubbers and latices, when produced in France, will be used increasingly by textile, paint, and paper industries.

Malaya

Local Industry Opposes New Foreign Tire Plant

The Malayan Rubber Goods Manufacturers' Association was greatly stirred by the report in April that the Federation Government was entertaining proposals for establishment by an important foreign concern of a large tire factory to be set up in Petaling Jaya, at a cost of $50,000,000 (Straits). Although it was first said an American company was involved, the latest news states a British firm, Dunlop, is negotiating with the Malayan Government over a factory to be ready to go into full production by 1960.

American company or British, local rubber manufacturers want neither, and through the Association have sent several protests to the government, incidentally accusing it of discriminating against them in favor of foreign investors.

Shum Kwai Hong, president of the Association, told the Minister of Commerce & Industry, Tan Siew Sin, that local manufacturers had had high hopes of greatly expanding output and variety of rubber goods made here once the government had taken the necessary steps, by protective tariffs, tax incentives, etc., to encourage local enterprise. But a big establishment run by a financially strong foreign firm constituted a threat to the local industry, for not only would Malayan manufacturers not have a chance to produce tires themselves—Malayan demand could not support more than one tire factory—but they faced being "knocked out" by the foreigner in their own fields. For there was nothing to prevent the foreign firm from also producing articles like hose, footwear, cycle tires and tubes, mechanical goods and sheeting already made in Malaya, thus causing over-production and then —because of superior resources—engaging in "unfair competition," in which the Malayan firms must succumb.

After it was learned that Dunlop was the firm concerned, the Association made a further statement in which it said:

"Let the government not forget for a single moment that it is Dunlop's and other foreign firms who are responsible for the stagnation of the local rubber goods manufacturing industry during the past colonial regime by their unrestricted imports into the country. This was due to the lack of government protective duties."

The government's duty was to Malayans, not to foreigners, it stressed. It added that there was no logic in the government permitting foreigners to go into an industry as vital and essential as tire manufacture, and that Malayan manufacturers should be given a chance.

Labor Unrest Plagues Plantation Industry

The labor difficulties expected by the Union as a result of what it called the "arbitrary" cut of 30 cents in the daily wage of plantation workers duly developed. A rash of 24-hour strikes, involving thousands of workers, broke out in various parts of Malaya; according to Union estimates 67,620 laborers had stopped work by May 8, the third day after trouble started; M.P.I.E.A., the employers' association, puts the total at 25,000.

Up to the time of writing (May 10) there seemed no likelihood of a speedy settlement of differences. A meeting arranged for May 9 between union leaders and employers broke down soon after talks started, when employers suspended the meeting on receiving news that 2,000 workers had struck in Kedah despite their warning there would be no discussion of wage proposals if workers persisted in wild-cat strikes. M.P.I.E.A. announced it would not negotiate under pressure and that talks would be resumed only if the union took steps to prevent strikes or other action interfering with work, and if the union guaranteed that the strikes did not have the approval of the union executive council.

Mutual recrimination seems to be the order of the day, and ill-considered statements by the chairman of a branch of the M.P.I.E.A. have not helped matters. He stated his belief that the wage dispute was an "affair contrived for some ulterior motives" by the officials of the union who were being impelled by "some powerful internal pressure, some compelling reason entirely unconnected with the terms of employment."

The demands by the workers as now disclosed by the employers, are: (1) A basic minimum wage of $6.40 a day for tappers and additional payments for routine duties. (2) Wages of other workers to be increased $1.00 to $2.50 a day. (3) Paid holidays to be increased from the present 10 to 21 days a year; (4) A fixed weekly day of rest for estate workers.

The employers state that acceptance of these proposals would mean an increase of $300,000,000 in production costs. They are prepared, however, to negotiate for a new wage structure, and they offer:

(1) For tappers, a minimum basic wage including cost of living allowance, incentive pay for higher output and prosperity pay during periods of higher prices. (2) A breakdown of wages rates of daily paid workers into component elements as, minimum basic wage and prosperity pay; but these workers will get no increase in pay since their wages were raised 30% in 1956. (3) Revision of the agreement on overtime rates for the seventh consecutive day of working provided there is no fixed weekly day of rest which would result in a fall in rubber production.

Malayan Rubber Statistics

Malaya produced 158,899 tons of rubber in the first quarter of 1958, against 159,593 tons in the first quarter of 1957. Imports of rubber into Malaya rose by 18.7% to 97,372 tons, despite the situation in Indonesia.

Exports during the quarter under review, at 265,074 tons, were up 10% from exports in the corresponding months of 1957. The United Kingdom continued to be Malaya's best customer and increased her purchases by 21.6%, to 60,338 tons. But the United States took only 26,954 tons, or 23% less; Japan, with 24,812 tons (2.7% less) came next followed by China, with 20,613 tons, in fourth place. South American countries, (chiefly Argentina and Brazil) took a total of 17,972 tons, or 85% above the corresponding 1957 figure. At 5,751 tons, Spain's imports had doubled.

Latex exports in the first three months of 1958 totaled 29,955 tons, the highest for the first quarter of any year, and 22% above those for the 1957 period. The United States was the biggest buyer of latex, taking 8,444 tons; Britain followed with 7,546 tons; West

Germany increased her imports of latex by 39.7%, to 3,084 tons.

At the beginning of 1957, 55% of the total area of 1,300,000 acres of rubber on European estates in Malaya had been planted with high-yielding rubber, the United Planting Association of Malaya disclosed in its annual report. Out of this area of high-yielding rubber, 438,000 acres, or about 60% is now in bearing so that more than a quarter-million acres of this material have still to reach maturity.

The Federation of Malaya produced 11,235,000 pairs of rubber footwear last year, against 9,931,000 pairs in 1956, and output is still rising.

Great Britain

North British Rubber Expands

North British Rubber Co., a subsidiary of United States Rubber Co., New York, N. Y., has started construction in Edinburgh, Scotland, of a modern hose factory that is a major part of a $8,500,000 modernization program which will extend over the next four years. Ground was broken in early December for the new plant, which will be a one-story steel and brick structure with 145,000 square feet of manufacturing space. The building is expected to be completed in late 1958.

The building is being erected on a five-acre site. Over the past year 85 small structures that were part of the old plant were demolished to make way for the new structure and other planned construction work. The modern production equipment that will be installed in the new plant will be used to make hose for the world's oil fields, and also high-pressure hose for the British market. Both general types of hose are established products of the company whose Scottish employes have a worldwide reputation for craftsmanship.

During the past year the Edinburgh plant, called Castle Mills, has also doubled its tire production capacity. Plans are now being made to add still more capacity to the tire-making lines.

The long-term modernization program also includes additional mechanical goods production facilities at the company's other plant in Dumfries, where all types of canvas and rubber footwear are produced. A new power plant for the Edinburgh factory is also scheduled.

With the technical assistance of U. S. Rubber which became a majority stockholder in North British during 1956, the company also plans to add other new products. Among these are several recently developed types of industrial hose, transmission belting, vinyl plastic flooring, non-slip driving belts, molded plastics and sponge products.

IRI-PI Conference

At the joint conference which the Institution of the Rubber Industry and the Plastics Institute held in London on February 27, the following papers were presented: "Recent Advances in Polymerization Techniques," H. W. Melville; "The Rubber-Like State," G. Gee, University of Manchester; "Masterbatching Techniques," H. A. Braendle, Columbian Carbon Co.; "Radiation and Polymers," A. Charlesby, Royal Military College of Science; "Preplasticizing Methods," R. Schooley, Windsor, Ltd.; "Radiation Processing," T. Bain and W. H. T. Davison, Tube Investments Research Laboratories; "Rubber/Resin Combinations," Institut Francais du Caoutchouc, "Mastication Polymerization," W. F. Watson, B.R.P.R.A.; "Urethane Foam Process," J. T. Watts, I.C.I. Dyestuffs Division; "Expanded PVC," F. Chapman, Whiffen & Sons; "Properties of Cellular Polymers," A. Cooper, Expanded Rubber Co., Ltd.

Import Problem

British rubber footwear manufacturers are complaining of unfair competition from imported articles, particularly from Czechoslovakia, Yugoslavia, and Poland. There seems to be good grounds for believing that the prices at which these goods are offered for sale in Britain are far below those at which they are sold in the countries of origin. The Rubber Footwear Association has been urging the Board of Trade to take suitable action in the matter. It is added that more than three-quarters of the total footwear imports, equal to about half the output of the United Kingdom, come from Hong Kong.

Russia

NR with Carboxylates

Investigators at the Academy of Sciences, Leningrad, studied the reactions of natural rubber with EAD (ethyl-azodicarboxylate) and DEAD (ethyl diethylene dicarboxylate) as well as the mechanical properties of the branched and cross-linked products obtained.[1] The branched polymers were prepared by adding EAD to a 5% solution of smoked sheet in benzene; the reaction was carried out at a constant temperature of 60° C. for two hours, under constant stirring. The effect of the addition of EAD was a gradual reduction in the viscosity of the rubber solution.

For the cross-linked derivative, a given amount of DEAD was added to the natural rubber solution, which was then placed under vacuum to permit the solvent to evaporate at ambient temperature and vulcanized for two hours at 60° C. A third group of samples was prepared by adding varying amounts of DEAD to rubber solutions containing one molecule of EAD for every 10 isoprene units.

Judged by their mechanical properties, the derivatives obtained bore little resemblance to natural rubber vulcanized with sulfur; the difference was especially marked in the case of the DEAD plus EAD products, for which tensile was exceedingly low; the best value (with 10% EAD plus 4% DEAD) was 33 kg/cm^2 (469 psi.). The rubbers in which 4% of DEAD alone was incorporated showed the highest tensile values obtained in these tests, 114 kg/cm^2 (1621 psi.). The effect of even small additions of EAD was to increase elongation.

[1] *Rev. gén. caoutchouc*, Aug., 1957, p. 798; translated from *Colloid J., U.S.S.R.*, 18, 3, 285 (1956).

Belgium

Chemical Congress

The world-wide interest in the 1958 International Exhibition at Brussels made Belgium also the logical choice for the thirty-first International Congress of Industrial Chemistry. So from September 7-20, 1958, this Congress, organized by the Société de Chimie Industrielle, Paris, France in collaboration with the Federation of Belgian Chemical Industries, is to be held in Liege, an important center of the Belgian chemical industry about 100 kilometers from Brussels.

The scientific papers to be presented will be classified under 10 groups, subdivided into 30 sections. The groups and sections of interest to the high polymer chemist and industries are:

Group II. Section 9. Petrochemical Industries.

Group III. Section 10. Nuclear Sciences.

Group VII. Section 19. Plastics; and Section 20. Paints, Varnishes, Printing inks.

Group IX. Section 29. Problems in the Colonies.

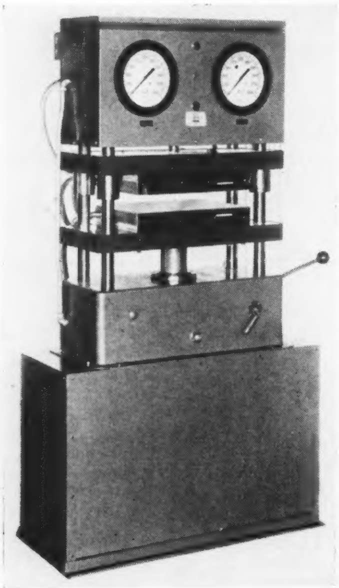
Group X. Section 30. Productivity Problems, Organization of Research—Hygiene and Safety.

Further information is obtainable at the General Secretarial Office, 32 Rue Joseph II, Brussels IV, Belgium.

(Continued on page 489)

NEW EQUIPMENT

P.H.I. Lab Presses



New P.H.I. Lab Press

Pasadena Hydraulics, Inc., El Monte, Calif., has announced a new self-contained hot platen bench press which is said to provide an unusual range of uses for the laboratory and research of pilot-production applications.

This laboratory press has provisions for precise pressure readings from pounds to tons and controlled platen temperature. Other features include: counterbalanced upper platen operated by small-diameter 10-ton ram and guided by anti-friction bearings for accurate low-pressure readings; lower platen operated by large-diameter ram for pressure to 20 tons; large pressure gages of the recalibration type; electrically heated platens with individual thermoswitch controls from ambient to 600° F.; self-contained hydraulic system which includes patented two-stage pump; and compact, all-steel construction.

The sizes of the platens are 12½ inches front to back, 18½ inches left to right. The frame is of all-steel, four-corner post design. Its dimensions are: base, 16 by 33 inches; height, six feet overall; and weight, approximately 2,500 pounds.

A circular giving further information is available from the company.

Slideback Bagless Autoform Press

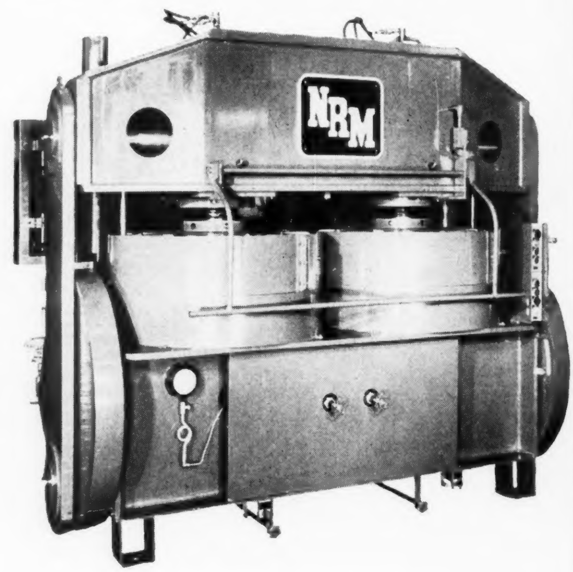
National Rubber Machinery Co., Akron, O., has announced the addition of two new design features to its line of Autoform tire vulcanizers. One, the Slideback side-plate press design, provides for the upper set of molds to move back when the press is opened, thus giving unlimited head room and free access to the molds. This construction makes possible easy and less expensive press loading arrangements and provides for installation of automatic post inflators. The vulcanizer is furnished either as a conventional bladder-type press, or combining the new NRM bagless curing feature described below. It is equipped with automatic blow-off and costs no more initially than do presses which are not designed for addition of automatic unloading. It is reported that one operator can handle up to 65 Slideback Autoform presses (130 tire cavities) in a normal cure cycle.

The second feature, the Bagless Autoform, is said to be the first successful application of the bagless curing principle. It incorporates a new-type bead clamping device which permits using the tubeless liner of the tire being cured to hold the curing medium. Internal heating and curing are thus applied directly to the tire carcass. Elimination of bladders, along with their associated costs in labor, materials, and tire spoilage due to bladder failure, results in faster curing at cost savings that production tests have shown can range as high as 11½¢ per tire, according to the firm.

Simple design of the new-type bead clamp assures positive action and minimum maintenance. It permits curing all passenger tire sizes of same bead diameter with the same clamp ring, by allowing for various bead ledge width to accommodate changes in tire construction.

The bead clamps are faced with specially compounded resilient material which compensates for all normal variations in tire beads, thus providing for consistently perfect bead molding. Existing tire molds may be used in the bagless vulcanizer without alterations, and the bagless feature itself may be applied to existing Autoform vulcanizers with only minor adaptations.

Requests for details and to arrange demonstrations should be made to the company.



NRM Slideback Bagless Press

F-B Crown Compensator

The new Farrel crown compensator has been developed by Farrel-Birmingham Co., Inc., Ansonia, Conn., to apply the cross-axes principle of roll-crown control to existing calenders which have connecting gears mounted on the rolls. In general, this mechanism can be built into any three-roll or four-roll calender now in service in which the rolls can be removed through the frame openings, according to the firm.

With the crown compensator, it is said gage accuracy and improved lay-flatness of plastic film and sheet can be obtained over a greater range of gages. On rubber sheet and coatings, the improved uniformity of gage effects substantial economy in the amount of stock used.

Adjustments can be made by push-button control to compensate for differences in separating force caused by changes of gage and variations in stock composition, operating temperature, and speed. The maximum amount, it is claimed, of crown change possible is approximately 0.012-inch for a calender with 24-inch-diameter rolls, and proportionately less for larger machines.

The device consists of complete new bearings for the roll to be crossed, a new swivel-connecting gear for this roll, and a small gear-motor for varying the amount of crossing. The main outer bearing housing fits into the frame in the customary manner with the usual side clearance. Existing screw mechanism is used for roll adjustment.

Some features of the new equipment include: two special journal boxes which enclose and support full-circle bronze bearings with labyrinth-type oil seals. The inner bearings rest on heavy-duty, ladder-type, ball, thrust bearings that are said to permit each end of the roll to be moved horizontally while

New Method Makes Oil Selection Easy

Sun's new brochure, "A GRAPHIC METHOD FOR SELECTING OILS USED IN COMPOUNDING AND EXTENDING BUTADIENE-STYRENE RUBBERS", outlines a method for selecting the best oil for a given processing problem.

Using this method, you can predict, with more certainty than ever before, characteristics such as processibility, low-temperature behavior, volatility, polymer degradation, and staining tendencies. You can get this new brochure from your Sun representative. Ask him, write him, phone him. He can help you select the best oil for your particular needs. Or write to Industrial Products Dept., SUN OIL COMPANY, Phila 3, Pa., Dept. RW-6.

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Owen 5-6164

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Lexington 2-9200
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Pelham 8-3040
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Granite 2-0296

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Akron 10
Blackstone 3-7733
Cincinnati 4
Wabash 1-5500
Cleveland 5
Vulcan 3-6100
Columbus 4
Broadway 4-1158
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Baldwin 2-2531
Toledo 1
Oxford 3-4461
Youngstown 12
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Beaver
Vanport
Spruce 4-9440
Brownsville
W. Brownsville
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Erie 8-3131
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Olympic 4-6795
Greensburg
Greensburg 5600
Harrisburg
Cedar 4-0115
Johnstown
Johnstown 33-2111
Marcus Hook
Chester 5-1184
Philadelphia 3
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Pittsburgh 38
Sterling 1-1252
Reading
Franklin 6-7464
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Williamsport 8-8661

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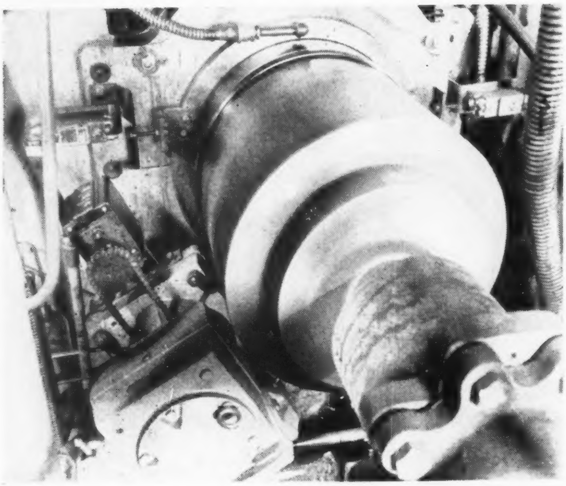
New Equipment



New Farrel calender crown compensator

the calender is in operation. Movement is obtained by built-in opposed adjusting screws, self-alining bearing seats, and worm-gear units arranged to move inner bearings in opposite directions.

Other features are one right-angle gear-motor, a magnetic reversing starter, and a push-button station; one forged-steel, cut, double-helical, self-alining connecting gear, consisting of an outer rim driven and supported by a separate inner hub. The hub has spherical teeth which mesh with teeth in the rim in a manner similar to a self-alining gear-type coupling. Another feature is a large-figured counter to show the amount of roll crossing. Normally chain-driven from the motor shaft, this counter can be selsyn-driven and mounted at the operator's panel, if desired.

A technical bulletin, "The New Farrel Crown Compensator for Increasing the Range of Gages of Existing Calenders," is available from the company.

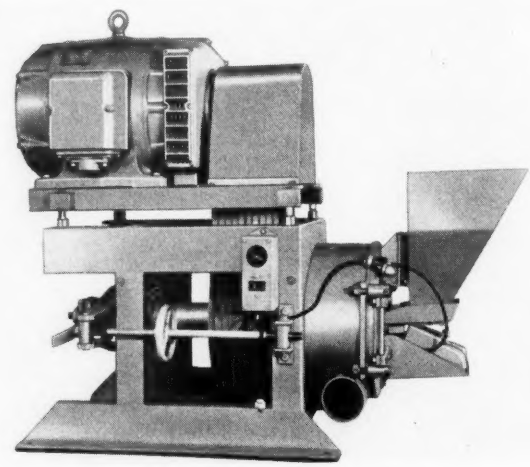
Foremost Attrition Mill

A completely new water-cooled attrition mill and scrap recovery system have been developed by Foremost Machine Builders, Inc., and are being demonstrated by The Rainville Co., Garden City, N. Y. The results of this new design are said to be phenomenal in that the production of 20-mesh scrap material and below is approximately double the production of previous designs utilizing the old span grinder and the same horsepower.

On most cured rubber Rainville has tested the production of the attrition mill on the first pass is 700 to 900 pounds per hour. The attrition mill reduces this ground rubber to 20 mesh and below. When a customer desires a lower mesh than 20, he must screen the material and return the oversize particles to the attrition mill. The discharge from the mill is blown by air to a cyclone separator which deposits the material on a continuous screening set-up. These screens are arranged specifically for the mesh required. Assuming that the required mesh is 30, this material is drawn off and delivered to the point of use. All oversize material goes back through the mill. The total production at 30 mesh after the rescreening process is generally 300 to 350 pounds per hour. This also varies with the type of rubber being processed.

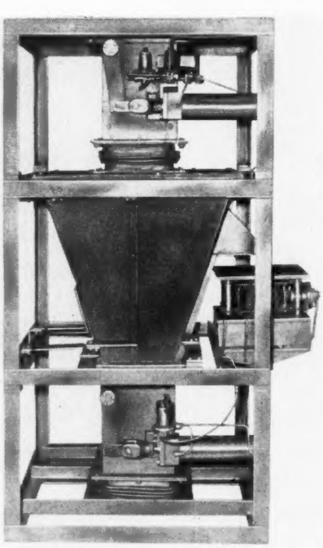
The cost of maintaining this operation varies with the abrasiveness of the rubber. The cutting knives in the rotary chopper and the water-cooled disks in the attrition start to lose their efficiency within 40 to 100 hours, depending upon the abrasiveness of the product. The attrition mill disks must be replaced and sell for $80.00 a pair. The rotary chopper knives can be re-sharpened and reset several times before replacement is found to be necessary.

A complete system, including rotary chopper, attrition mill, screening equipment, feeding and recycling equipment, can be obtained through The Rainville Co., Inc., Foremost's national representatives. Demonstrations of the system will be made on request. A rubber reprocessing installation price sheet and engineering details are available from Rainville.



Foremost's water-cooled attrition mill

New Unitized Hopper Scale



W-C unitized hopper scale

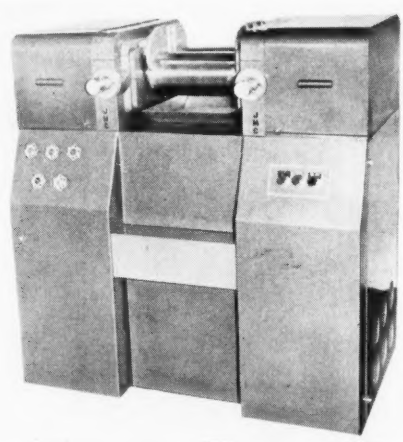
A unitized weighing hopper scale which gives new standardization and flexibility to automatic weighing systems has been developed by Weighing & Control Components, Inc., Hatboro, Pa. The W-C hopper scale consists basically of three pre-engineered frames — feed, hopper, and discharge—put together by building-block techniques to form the unitized weighing assembly. The feed and discharge frames can accommodate a selection of gate valves, slide gates, screw feeders, vibratory feeders, or similar units. Since these units are standardized and pre-engineered, a considerable economy is effected, and scales are readily adapted to present and future needs, with little or no modification of existing system components.

The hopper frame contains a flexure-mounted hopper which transmits a vertical force component to the pneumatic or electric weight transmitter, a rugged unit guaranteed to be accurate within ±0.25% of calibrated weight range. Standard hoppers have maximum capacities ranging from five to 90 cubic feet of material.

Added utility is provided by the scale's adaptability to accounting and control instrumentation. Weight information can be indicated, recorded, or totalized; it can be used for automatic batching, blending, inventory control, or other functions. Control can be partly or fully automatic, with instruments located remotely or at the scale.

Full details about the W-C unitized weighing hopper scale and its applications are available in Catalog 12, from the company.

New Equipment



JMC two-roll mill

New JMC Lab Mill

This new two-roll six- by 13-inch lab mill has four-inch diameter journal necks which, according to the manufacturer, Johnson Machinery Co., Newark, N. Y., are the largest used in the building of this type of machine. Pictured herewith is the new model now in production.

Other features of this mill are hardened and ground steel rolls —six-inch diameter by 13-inch face; overall dimensions, 48 inches wide by 49 inches high by 27 inches deep; 7½ hp. 3/60/220-440-volt geared motor; steel top cap frames; heavy-gage steel cabinet-type base; knee-type safety controls; automatic pressure lubrication; and optional equipment and accessories.

The streamlined cabinet can be furnished in a wide variety of six colors, in keeping with today's trend toward color harmony in laboratory and plant.

A brochure describing this plastics and rubber mill is available from the company.

New Microhygrograph

An instrument which makes possible the graphing of minute changes in ambient relative humidity is now available from Serdex, Inc., Boston, Mass. This instrument, called a Microhygrograph, utilizes the extremely sensitive Serdex diaphragm (a specially designed animal membrane) and makes minute

(Continued on page 474)

Serdex Microhygrograph for recording humidity changes

NEW MATERIALS

	Santicizer 165	DOP	Typical Butyl Octyl Phthalate
Low-temperature flex, T, °C	−40	−39	−39
Volatility, % plasticizer lost	10.6	4.8	16.0
Shore A hardness, before aging	75	73	75
After aging	75	73	83
Water extraction, % absorbed	0.52	0.40	0.55
% solubles extracted	0.02	0.02	0.06
Kerosene extraction, % plasticizer lost	23.0	35.0	20.0

Santicizer 165

A new fast-fusing primary plasticizer for polyvinyl chloride which is said to impart good general-purpose properties to floor tile, plastisols, film and sheeting, extrusions and other formulations at low cost has been announced by the organic chemicals division, Monsanto Chemical Co., St. Louis, Mo.

Trade marked Santicizer 165, the new plasticizer is described as a chemically blended mixed alcohol phthalate offering good heat and light stability and a low-temperature flexibility equal to that of dioctyl phthalate. Its volatility, while slightly higher than that of DOP, is said to be far lower than that of butyl octyl phthalate.

Some tentative specifications for Santicizer 165 follow:

Acidity	0.12 meq/100 grams, maximum
Color	30 APHA, maximum
Moisture	0.12% maximum
Refractive index at 25° C.	1.484–1.487
Specific gravity, 25/25° C.	0.989–0.994

Shown below is a comparison of Santicizer 165 with DOP and butyl octyl phthalate at a 67 PHR (40%) plasticizer level.

Butazate 50-D

Now available from the Naugatuck Chemical Division, United States Rubber Co., Naugatuck, Conn., is Butazate 50-D, a water slurry of Butazate (zinc dibutyl dithiocarbamate). It contains 50% by weight of active accelerator. It is intended for use in accelerating both natural and synthetic rubber latex compounds. The slurry is reported to be stable, entirely compatible with such latices, and may be added directly to them with simple stirring. Its use eliminates the necessity of making up ball milled pastes from dry powders and thus simplifies the task of compounding.

Butazate is used in latex because of its fast, low-temperature curing characteristics. It may be used alone, but finds more general application in combination with O-X-A-F (zinc mercaptobenzothiazole). Such combinations give a broader curing range and insure high tensile and excellent aging properties in the finished product. They are also non-discoloring and non-staining. These combinations are well suited for accelerating compounds for dipped goods, fabric coatings, rug backing, and general-purpose goods.

Typical accelerator combinations, as adapted to the various products mentioned, are shown in a technical bulletin, No. 223, which is available from the company.

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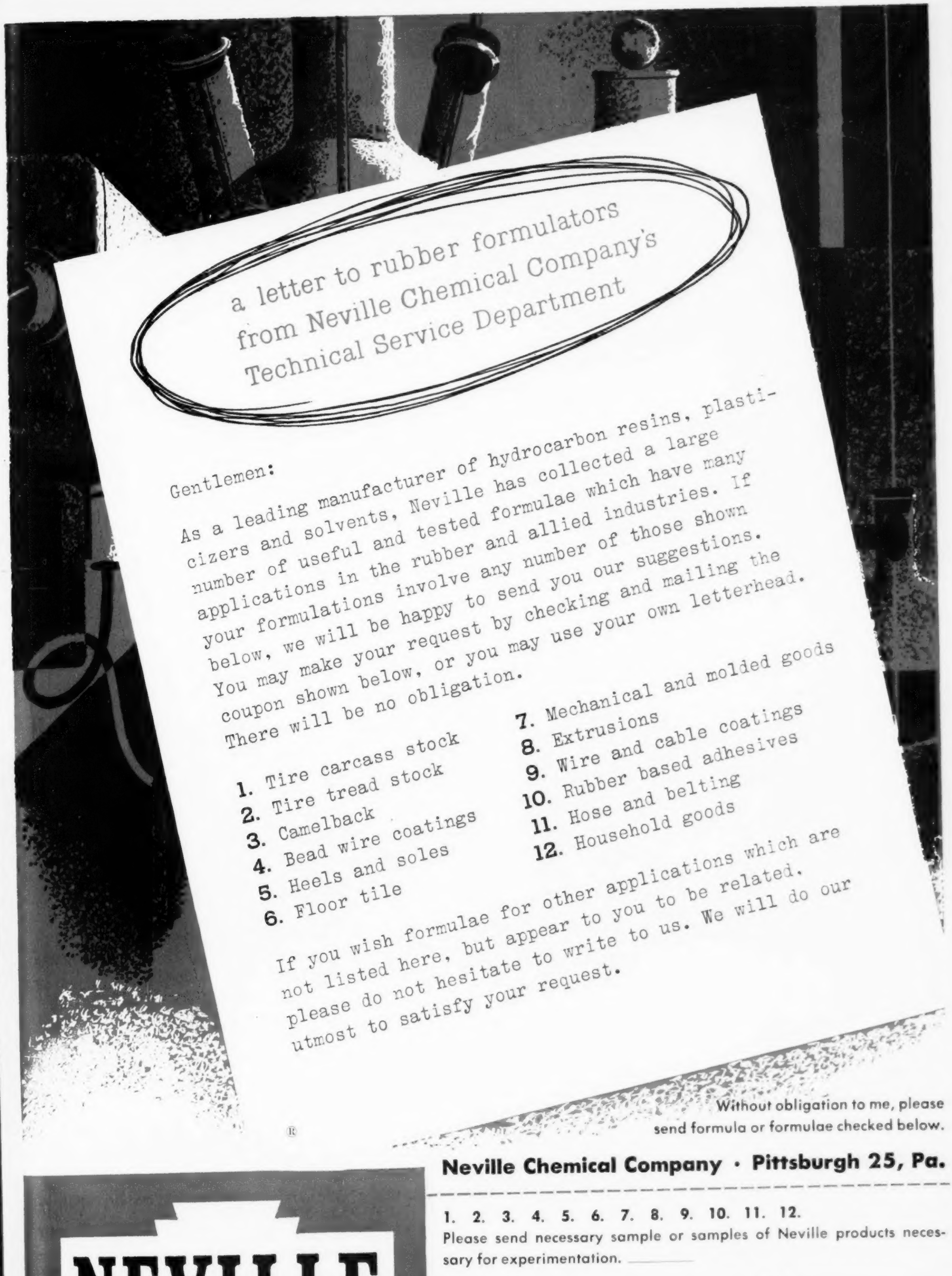


New Materials

XK-1039 Silicone Rubber

The silicones division, Union Carbide Corp., New York, N. Y., has introduced a new member of a series of general-purpose silicone rubber compounds, called Union Carbide XK-1039. This extremely hard compound can be molded, extruded, or calendered. It is available in neutral color as XK-1039 and in red color as XK-1039R.

The new silicone rubber is ready for use after freshening on a roll mill. Catalyzing and freshening can be combined in one operation. Mills and other equipment should be cleaned and free from contaminating organic materials. The rubber is said to have no toxic additives, low moisture absorption, and very low compression set.

The recommended initial mold cure on sections such as ASTM test slabs is 10 minutes at 250° F. with the benzoyl peroxide type catalysts, and 15 minutes at 320-340° F. with Union Carbide X-1960 silicone rubber curing compound or ditertiary butyl peroxide (DTBP). For most applications, a postcure in a circulating air oven for a minimum of 16 hours at 480° F. is suggested. Thick sections, such as rolls, cured with X-1960 are not usually postcured.

Some typical physical properties of Union Carbide XK-1039 follow:

Mold cure, 20 min./340° F.	
Hardness, Shore A	75±5
Tensile, psi	710
Elongation, %	100
Postcure, 24 hr./480° F.	
Hardness, Shore A	85±5
Tensile, psi	950
Elongation, %	75
Tear, Die B, lb./in.	35

Oil resistance ASTM, 70 hr.	ASTM Oil No. 1*	ASTM Oil No. 3†
Hardness change, Shore A units	−5	−17
Tensile change, %	−13.6	−11.6
Elongation change, (% of original)	0	10
Volume change, %	±5.3	−26.7
Decomposition and tackiness	none	none

Water immersion, 70 hours at 212° F.	
Volume change, %	+1.1
Hardness change, Shore A units	−1
Compression set, 22 hr./350° F., % original deflection	24

* At 350° F.
† At 300° F.

A four-page data sheet (SF-1124) describing the properties of the compound and the catalysts that may be used, is available from the company.

New Silicone Rubber Compounds

Excellent physical properties are said to be features of three new general-purpose silicone rubber compounds developed by the silicone products department, General Electric Co., Waterford, N. Y. Designated SE-452, SE-472, and SE-482, these meet or exceed MIL-R-5847C Class II specifications.

Tensile strengths of 800 to 1,400 psi., tear strengths of 80 to 200 psi., and elongations of 250 to 550% are obtainable with these rubbers. Properly cured parts fabricated from these compounds exceed the appropriate tensile strength requirements of MIL-R-5847C by 23 to 54%.

Because of their good physical characteristics which also include very low water absorption and good resistance to compression set, these rubbers are suggested for a wide variety of sealing, gasketing, and mechanical applications in the aircraft, automotive, appliance, electrical, and other industries.

SE-482 offers greater tensile strength than any other commercially available 80-durometer silicone rubber, according to G-E, and is best suited for fabrication by molding and calender-

(Continued on page 474)

NEW PRODUCTS

Ramflex—Asphalt Additive

U. S. Rubber Reclaiming Co., Inc., Buffalo, N. Y., now makes available a product called Ramflex—a free-flowing, devulcanized rubber specially prepared to be used in combination with asphalt for highway and general paving applications. Field-tested for six years in many miles of busy roads, Ramflex has proved itself to impart increased structural stability to asphaltic-type pavements, according to the company.

While ideal as a surface course for new pavements, Ramflex is also equally suited in providing a tighter, longer-lasting hot patch for crumbled pavements.

In cold weather, Ramflex reduces the brittleness and increases the impact resistance of asphalt concrete, thereby improving the load-carrying capacity of the surface.

In hot weather, this rubber material will reduce the softness of a pavement, thus reducing displacement or shoving. Because a rubber-asphalt combination has less tendency to flow, bleeding at high temperatures is minimized. Under all temperature conditions the adhesion of the asphalt to the aggregate is said to be improved.

This low-cost material can be added directly to the aggregate in pug mills without the necessity of specialized equipment. Its further versatility permits application in a conventional spreader without gumming the mechanism and permits closer rolling to the spreader, resulting in better compaction.

A free illustrated catalog is available from the company.

New Reinforced Tile

Robbins Floor Products, Inc., Tuscumbia, Ala., has introduced its Robbinette Line—an 0.080-inch gage plastic reinforced tile composition of rubber and plastic. The new material is priced to compete effectively with vinyl asbestos. It is, however, a homogeneous composition, designed for longer wear than similarly priced laminated flooring materials.

According to the company, the Robbinette Line provides a highly styled, high-quality flooring at low cost. In the past, one of the shortcomings of rubber tile has been that it lacks much of the color depth and sparkle of plastic flooring. By combining plastic with rubber for the Robinette Line, the company claims it has achieved strong, bright modern colors. These colors have been selected in accordance with consumer preference data accumulated by Robbins during a two-year color research and testing survey. The nine scientifically selected marbleized colors are antique white, brown, gray, turquoise, green, red, coral, tan, and black.

Improved Fuel Oil Hose

A new, faster-flowing fuel oil hose claimed to speed truck-to-home delivery by 17% has been announced by B. F. Goodrich Industrial Products Co., Akron, O. The hose has the same outside diameter as the conventional 1¼-inch fuel oil hose, thus permitting the same amount of hose per reel.

Flow is increased up to 20%, without sacrificing strength, by enlarging the inside diameter of the hose from the conventional 1¼ inches to 1⅜ inches. A new combination of reinforcing fabrics permits the new thin wall design to withstand the same working pressures as regular fuel hose. The hose has a black cover which resists oil, weathering, and abrasion.

Drilling and Fire Hose

Republic Rubber Division, Lee Rubber & Tire Corp., Youngstown, O., has made announcement of its new cable-type rotary drilling hose and its new Dacro-Prene fire hose. The drilling hose features a nipple head of tough alloy steel, a firmly attached collar, a specially compounded gasket, uniform strength the entire length of the hose, a hot oil and abrasion-resistant Reprene tube, multiple fabric plies, embedded steel cables, circumferentially wound steel cable, and an extra-tough Reprene cover with resistance to weather, cutting, abrasion, and oil.

There are two specifications of the Dacro-Prene fire hose—K-19 and K-20. K-19 is a single-jacket fire hose made with all-Dacron jacket of loose-edge construction, with a neoprene tube. K-20 is the same hose as K-19 except that the all-Dacron jacket is impregnated with neoprene. Both specifications are tested to 500 pounds.

Dacro-Prene hose is primarily for use in refineries and chemical plants or in industrial plants where the presence of grease and/or chemicals could cause deterioration of cotton-jacket hose. Dacro-Prene hose is reported to have these advantages over cotton hose: lighter—same strength with less weight; wet weight is less; dries faster; resists mildew, greases, acids and abrasion better.

Package Conveyor Belt

A conveyor belt that can carry cartons up slight inclines, yet slides easily beneath the package when a gate is used, has been added to the conveyor belt line of United States Rubber Co., New York, N. Y.

The belt, called the U. S. Perfection Package Conveyor Belt, features a folded-edge construction utilizing three, four, or five plies of 28- or 32-ounce cotton duck. On both sides it has a black friction surface, enabling the belt to slip beneath the package and preventing materials from piling up and jumping a gate. This belt can also be used for slider service where the belt operates over a hard wood or metal surface.

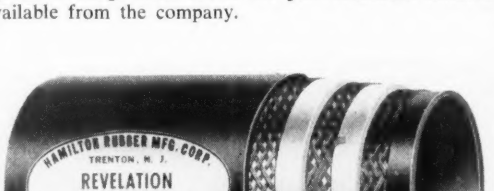
Widest use of the belt is foreseen in canneries, bottling plants, food processing plants, department stores, warehouses, pharmaceutical plants, breweries and distilleries.

Hamilton's Revelation Hose

Hamilton Rubber Mfg. Corp. Division, Acme-Hamilton Mfg. Corp., Trenton, N. J., has developed a rugged, flexible, easy-to-handle hose for conveying gasoline, oil, and other petroleum liquids. Known as Hamilton Revelation tank wagon hose, it is designed for unloading these liquid petroleum products from storage tanks, tank cars, and tank trucks.

Its construction features an oil-resistant tube covered with impregnated plies of horizontally braided cable cord yarns. A conducting wire, included in the braid, handles static electricity. Further hose protection for long wear is provided by an abrasion and oil-resistant cover. Made on steel mandrels, the new hose has a smooth and true inside diameter that assures full-flow.

Available in lengths up to 50 feet, Revelation tank wagon hose comes in four ID sizes ranging from two to four inches. Working pressures range from 108 to 285 psi. Additional information is available from the company.



Hamilton Revelation tank wagon hose

New Products

FWT-2 Nylon Truck Tire

A new special-purpose nylon truck tire, designed to give improved service in heavy truck usage, has been announced by the Goodyear Tire & Rubber Co., Akron, O. Named the FWT-2, the tire is specially adapted for use on front wheels of concrete ready-mix trucks and high-volume stone and gravel haulers, where the axle is heavily loaded and short turns with power steering are common.

Truck owners may also use the tire on drive and trailer wheels for similar heavy duty. The tire can be operated at normal speeds in local highway use.

The company's new special-purpose nylon truck tire has three wide ribs designed to resist edge tearing, and a tread radius which gives good forward and lateral traction. The design reduces the tendency for stones to catch in tread grooves and cleaning edges, according to the firm.

FW-2 tires, with Xtra Tread non-skid depth, are available in two sizes: 10.00-20, 12-ply rating, and 10.00-22, 12-ply rating. The tire is also available in size 11.00-20, 12-ply rating, with standard tread depth. Designation is FW-2.

Rib Hi-Miler Nylon Tire

A new all-nylon cord truck tire in the competitive price range —the Rib Hi-Miler Nylon—also has been placed on the market by Goodyear. Priced 10% above Rib Hi-Miler rayon tire prices, the new tire is made of triple-tempered 3-T nylon cord and features the wide, flat, five-ribbed tread design of its popular rayon counterpart.

This nylon tire is within the reach of every truck owner, stated Goodyear, and the company is wasting little time in making it available for purchase. District warehouses have already received quantities of the new tire.

The Rib Hi-Miler Nylon is made in tube-type construction in sizes 6.00-16 through 10.00-22. Tubeless versions come in 6.50-16 and 6.70-15 sizes.

Uniphase Cork Gasket

Development of a new type of cork gasketing material designed to eliminate seepage and leakage of liquids and gases in applications where neither cork composition nor cork-and-rubber have been completely satisfactory has been announced by Armstrong Cork Co., Lancaster, Pa.

The new gasketing material, called Uniphased Cork, offers the optimum combination of impermeability, conformability, and chemical inertness. Uniphase Cork combines many of the features of cork compositions and cork-and-rubber materials, yet in many respects is superior to both.

Made with a new continuous-phase elastomeric binder that surrounds and embeds the cork particles, Uniphase Cork forms an impervious barrier to fluids. It has significantly greater resistance to contained fluids than other resilient gasket materials because the binder more closely approaches the chemical inertness of cork itself.

Uniphase is extremely resistant to fungus attack and has ozone resistance in excess of the best non-metallic gasket materials specially compounded for this property.

Uniphase Cork seals over a wider range of flange pressures than any other gasket material. It seals perfectly at flange pressures as low as 100 psi., a reduction of 75% from pressures usually required by most cork-and-rubber materials. Flange loads as high as 4,000 psi. will not crush Uniphase or cause it to extrude.

It seals at very low flange pressures because the elastomeric binder actually conforms directly to the flange surface, completely filling surface imperfections, and the manufacturing process retains to a high degree the natural conformability of cellular cork. Uniphase cork gasketing has a density of 23 to 27 pounds per cubic foot, a tensile strength of 175 psi. minimum, elongation at break of 30% minimum, and good water and oil resistance.

New Materials

Silicone Rubbers

(Continued from page 470)

ing. It may be blended with the softer SE-452 to obtain compounds of intermediate hardness.

SE-472, a 70-durometer hardness stock, and SE-452, a 50-durometer stock, are said to have excellent processing characteristics and are especially suited for fabrication by extrusion. SE-472, which meets the standards of AMS 3357 as well as those of MIL-R-5847C, is also well suited for calendering.

All three rubbers may be used in extended service over the temperature range of —75 to 500° F. Although manufactured as white compounds, they may be tinted to obtain a wide variety of colors. Complete product and application information, in addition to a product data sheet, SE-482U, may be obtained from the company.

Chemigum Latex 248

Chemigum Latex 248 was developed by the chemical division, The Goodyear Tire & Rubber Co., Akron, O., to meet the need of a high solids latex having good color stability. It is said to compare favorably in resistance to heat and light discoloration with Chemigum 247 Latex.

The latex has a synthetic surfactant-type emulsifications system which is reported to give it excellent compounding and process stability. It is proving to have the necessary balance of properties to make it an outstanding general-purpose medium nitrile latex. It can be used for coating, saturation and pigment binding applications. It also provides a good base for nitrile-type latex adhesives.

Some typical properties of Chemigum Latex 248 follow:

Butadiene/acrylonitrile ratio	67/33
Total solids	55%
Stabilizer	synthetic anionic
Antioxidant	non-staining
pH	9.0
Particle size average	2,500 Angstroms
Specific gravity of polymer	0.98
Solids, lbs./gal.	4.5
Brookfield viscosity 20 rpm	200 cps.
Surface tension	35 dynes
Mechanical stability	excellent
Storage stability	excellent
Acid and salt ion tolerance	medium

Additional information is supplied in Tech-Book Facts Bulletin No. 58-56, which is available from the company.

New Microhygrograph

(Continued from page 466)

fluctuations in relative humidity visible by recording them on an outsize 12- by six-inch chart. Readings to less than 1% relative humidity are possible. The chart covers a 24-hour period.

No correction charts or calculations are necessary. The Microhygrograph is an ideal instrument to study industrial production and to monitor air conditioning systems which are used to control humidity accurately in many industrial and laboratory operations. These include electronic data processing machine and electronic computer operations. The Microhygrograph is also valuable in meteorological service and can be used inside or outside, since the case is aluminum, and the linkage is of weather-resistant metals.

This instrument is carefully checked at the Serdex laboratory to assure ±3% accuracy at all times. Operating range is 15 to 95% relative humidity at temperatures from 32 to 130° F. At temperatures below freezing, viz., 32°, a correction chart is used.

TECHNICAL BOOKS

BOOK REVIEWS

"Physical Chemistry." By E. A. Moelwyn-Hughes. Cloth covers, 6½ x 9¾ inches, 1304 pages. Pergamon Press, Inc., New York, N. Y. Price $15.00.

This is an expanded and modernized version of the author's, "Introduction to Physical Chemistry," Cambridge University Press, 1940.

"Physical chemistry deals with," the author states, "all chemical phenomena which can be studied quantitatively."

This theme is in fact the authors' method for introducing his subject to the student. First—quantitative experimental data relating to the chemical phenomenon being studied is introduced; second—the mathematical formulation of a theory (or theories) is given to explain the experimental observations first introduced.

Although the subject matter is that of the usual "Phys. Chem." course, the treatment is advanced and for the mature student. Mathematical appendices are included to help smooth out some of the difficult passages encountered in the text.

This book will prove interesting to students determined to master the subject and helpful to maturer scientists who wish to keep abreast of it. It is truly a magnificent book.

"Industrial Chemicals." Second Edition. By W. L. Faith, D. B. Keyes, and R. L. Clark. Cloth covers, 6½ x 9½ inches, 854 pages. John Wiley & Sons, Inc., New York, N. Y. Price $16.00.

Give four processes for making phenol, including reactions, flow diagrams, commercial yields, material and utility requirements, and properties of the finished product.

Discuss the economic aspects of phenol production, giving production and price patterns, major areas of use, and important producers.

No—this is not an examination in industrial chemistry; but answers to these questions, and more, may be found on pages 581-591 of the Faith-Keyes-Clark handbook!

One hundred and forty commercially important chemicals (from acetaldehyde to zinc oxide) and 221 chemical processes are discussed in this book in the manner indicated above.

Although synthetic rubbers are not mentioned, other high polymers (cellulose acetate, cellulose nitrate, polyethylene, vinyl acetate, vinyl chloride) are discussed. Synthetic rubber monomers, acrylonitrile, butadiene, and styrene, however, are included. The chemical processes given include the latest available knowledge in this area. Bibliographies and publication references on the various chemicals and processes are not given.

Generally speaking this is a good book, and whenever one is pressed for an off-the-cuff, quick answer about any chemical or chemical process, this is one of the first places to turn to for help.

"Anthologie des Brévets sur les Matières Plastiques, Fabrication et Transformation. (Anthology of Patents on Plastics, Their Manufacture and Transformation.)" Volume I (1791-1930), No. 3. By Jean Delorme. Published by Editions Amphora, Paris, France. Paper, 6 by 9½ inches, 248 pages. Price, 1,600 francs.

In collaboration with the French publication, "Officiel des Matières Plastiques," Jean Delorme, former expert of the U.N. and the French Government, and now court expert, has undertaken the collection of all patents on plastics issued since 1791. The present book is the third and last part of Volume I, covering the period 1791-1930; it includes sections VI-XII, chapters 43-88, and covers: aldehyde and ketone resins; resins derived from acids and their esters (as colophony, derivatives of tall oil, copals, natural gums and resins, acrylic resins and glyptals); phenolics; aminoresins; plastics from proteins (from casein, gelatin, leather waste, blood, fish waste, silk, keratine, yeasts, bones, shells, fish scales, etc., and vegetable proteins); resins derived from heterocyclic compounds, and plastics with an inorganic skeleton.

Volume II, now in preparation, will cover the period 1931-1945.

NEW PUBLICATIONS

"Butyl Oleate Technical." No. 06-59-1-4-58. Harwick Standard Chemical Co., Akron, O. 1 page. This technical bulletin describes butyl oleate, a liquid low-temperature plasticizer for natural and synthetic rubbers. Chemical composition, chemical and physical properties, and recommended uses are included.

"Vinyl-Nitrile Rubber Study." Kenrich Corp., Maspeth, N. Y. 7 pages. This is a study on the effect of vinyl and Kenflex A in nitrile rubber. The Kenflex A is said to act as a mutual solvent or flux, and the results with respect to physicals and general quality of the compound are said to be excellent. The procedure, a discussion, formulations, and tabulated results are included.

"Ross Constant Temperature and Humidity Unit." No. 61. J. O. Ross Engineering, division of Midland-Ross Corp., New York, N. Y. 4 pages. This two-color bulletin illustrates and describes the compact self-contained constant-temperature and humidity control unit, including apparatus for heating, cooling, dehumidifying, and circulating air into the laboratory. Dry bulb temperature may be maintained within ½° F. and relative humidity within 1%.

"Laboratory Equipment Catalog." Catalog No. 58-L. Stewart Bolling & Co., Inc., Cleveland, O. 24 pages. This new catalog gives detailed engineering data on Bolling's machinery for processing rubber, plastics, and other materials. The data cover experimental mills, small-size production mills, refiners, calenders, presses, hydraulic units, vulcanizers, intensive mixers, and production equipment. The size, the capacity, and a description of the machines are included.

"Tenite Polyethylene." Eastman Chemical Products, Inc., Kingsport, Tenn. 36 pages. This booklet explains how Tenite polyethylene resins can be used to make a wide variety of functional and attractive plastic products. Applications include housewares, toys, appliances, packaging, paper coating, insulation, and pipe. Separate sections of the booklet are devoted to molding, pipe, film, coatings, blowing, and wire and cable covering. A detailed table of specifications of Tenite polyethylene is provided.

"A Graphic Method for Selecting Oils Used in Compounding and Extending Butadiene-Styrene Rubbers." Sun Oil Co., Philadelphia, Pa. 24 pages. From the results of a method of classifying oils according to certain physical properties, much useful information has been obtained on the performance of the oil during compounding operations as well as the performance of the finished rubber product. Characteristics such as processability, low-temperature behavior, volatility, polymer degradation, and staining tendencies can be predicted with reasonable certainty by this method. The viscosity and viscosity-gravity constant determine the position of the oil on the chart, from which the rubber compounder can determine compounding or finished rubber product characteristics.

"Dynamic Properties of Enjay Butyl and Their Applications." Bulletin No. 6. Enjay Co., Inc., New York, N. Y. 16 pages. This bulletin describes the dynamic properties of butyl, vulcanizations for dynamic applications, butyl adhesion to metals, properties of butyl compounds, and implications for butyl compounds. Butyl vulcanizates are characterized as materials that combine dynamic softness with excellent shock absorption. Various graphs and tables supplement the topics under consideration.

Technical Books

"Rubber Reviews for 1957." Division of Rubber Chemistry, American Chemical Society. G. E. Popp, Phillips Chemical Co., Akron, O., treasurer. Paper, 352 pages including decennial index for *Rubber Chemistry and Technology*, Vol. 21, 1948-Vol. 30, 1957. Price $5. This is the first issue of "Rubber Reviews," which is being published as the final issue of Volume 30 (1957) of *Rubber Chemistry and Technology* and is expected to appear each year as a fifth or "bonus" issue of *R C & T*. This new publication results from a recommendation of the New Publications Committee of the Division, which in 1956 advised that another edition of the ACS monograph, "The Chemistry and Technology of Rubber," by the late C. C. Davis and J. T. Blake, would take too long and that publication of short monographs as a fifth issue of *R C & T* would be more satisfactory. It is provided at no extra cost to members of the Division and subscribers; to others the cost is $5. The editorial board of "Rubber Reviews" is to be complimented on this first issue which contains the following articles: "Dynamic Properties of Elastomers," by S. D. Gehman; "Aging and Oxidation of Elastomers," by J. Reid Shelton; "The Vulcanization of Rubber with Sulfur," by David Craig; "Carboxylic Elastomers," by H. P. Brown; "Rubbers from Basic Monomers—Vinylpyridine Polymers," by J. R. Haws; and "The Chemistry of Carbon Black and Reinforcement," by M. L. Studebaker.

Publications of the Thiokol Chemical Corp., Trenton, N. J.:

"Structural Sealing with Elastomeric Type Sealants Based on Thiokol Liquid Polymers." 12 pages. This reference manual covers elastomeric sealants for all types of building applications, from curtain wall to conventional structures. Proper handling, mixing, color availability, and methods of applying the liquid polysulfide-base sealants are demonstrated. The manual is a comprehensive reference work for architects, contractors, and building management.

"Aluminum Filler Study." 2-58. 8 pages. This brochure reports the study of the use of aluminum and carbonate-type fillers, additives for improved glass adhesion, toxicological effects, and single-package systems for calking and sealing compounds based on Thiokol polysulfide liquid polymers. The booklet is intended primarily for formulators and applicators.

"Evaluation of Non-Black Fillers for Colored Butyl Compounds." Bulletin 104-3. 12 pages. The purpose of this study was to establish fillers, or blends of fillers, which will provide smooth colored butyl extrusion compounds and to develop effective butyl compounds with these fillers. Dry processed clays, wet processed clays, and calcined clays were compounded. Physical properties are given. Specially coated experimental clays were also evaluated.

"Evaluation of Non-Black Fillers for Colored Butyl Compounding." Bulletin 104-4. 8 pages. This bulletin covers the evaluation of miscellaneous non-black fillers (Group IV) which, because of their physical or chemical structure, could not logically be included in the previous bulletins of this series. The materials tested represent the high specific gravity fillers, blanc fixe and lithopone, as well as talcs, diatomaceous earth, and alumina. Zinc oxide and titanium dioxide are also included. Test procedure, physical properties, curing and extrusion data are listed or tabulated.

"A Study of Butyl Ozone Resistance." Bulletin No. 105. 8 pages. This study evaluates the relative ozone resistance of molded butyl rubbers and the general effect of cure time, filler materials, and additives on ozone resistance. Types of elastomers tested included butyl, polysulfide, chloroprene, SBR, and natural rubber. Materials, formulations, and test results are given.

"Organic Chlorine Compounds." Union Carbide Chemicals Co., division of Union Carbide Corp., New York, N. Y. 48 pages. This booklet details physical and physiological properties, use information, shipping regulations, handling and storage, and specifications and test methods for eleven organic chlorine compounds. The compounds discussed are ethylene dichloride, Chlorasol fumigant and solvent, propylene dichloride, trichlorethane, butyl chloride, 2-ethylhexyl chloride, dichlorethyl ether, dichlorisopropyl ether, triglycol dichloride, ethylene chlorhydrin, and epichlorhydrin. Test procedures and charts of physical properties are included.

Rubber parts courtesy of Brown Rubber Co., Inc.

ASRC is now in production with a new, non-staining "cold," low Mooney rubber—ASRC 3110—which offers improved processing of molded and extruded sponge rubber parts. Users can expect easier mixing . . . smoother extrusion . . . faster extrusion rates . . . smoother calendering . . . less shrinkage.

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Technical Books

"Highway Truck-Tire Data Book." B. F. Goodrich Tire Co., Akron, O. 42 pages. Nine main factors within the control of truck owners and operators determine the degree of service that will be received from truck tires. These factors, according to the booklet, are tire selection, mileage booster plan, inflation, loads and load distribution, mechanical irregularities, matching and spacing of duals, tire rotation, rims, and retread before failure. The booklet also describes the company's complete line of truck tires, suggests safety rules, and carries tables on load and inflation and weights and measures.

"Products, Profits and Plioflex." The Goodyear Tire & Rubber Co., Akron, O. 36 pages. This illustrated booklet describes the typical properties of the company's Plioflex, styrene-butadiene rubber (SBR), and compares them with the properties of other synthetic rubbers. The SBR production process is described. The various types of Plioflex rubber are considered as well as Pliolite rubber reinforcing resins, which are high styrene content styrene-butadiene copolymers.

"Synpol Technical Data File." Texas-U.S. Chemical Co., New York, N. Y. This technical data file contains complete information on the company's styrene-butadiene rubber (SBR), Synpols. Full technical descriptions and specifications, physical and chemical properties, typical production values, and standard test recipes are included. The included bulletins also contain numerous cost-tested compounding formulae and physical test data for a wide range of end-use applications. The attractive, easy-to-use binder will be periodically supplemented as new rubbers are introduced and additional compounding information is developed.

"Polco 806." Borden Chemical Co., New York, N. Y. 18 pages. Polco 806, a vinyl acetate copolymer emulsion described in this booklet, is intended for use in full-gloss latex enamels, high-quality latex concrete floor paints, and low-cost latex flat wall paints. The emulsion is reported to have included a novel cross-linking system which serves to cross-link the molecular chains of the vinyl acetate copolymer. This system is said to increase the washability and wet abrasion resistance of coatings based on Polco 806. The various properties and formulations of the emulsion are listed.

"Elastomer Compounds for Automotive Applications." SC:57-136. Shell Chemical Corp., Torrance, Calif. 16 pages. This technical bulletin gives formulations and physical properties for the company's S-polymers (styrene-butadiene rubbers, SBR). The recommended compounds are reported to meet the basic requirements of various grade numbers in ASTM D735-55T, Type R, covering a durometer hardness range of 30 to 90, with high and low tensile strength formulations offered within each hardness category, in most cases. ASTM D735-55T is designed to provide a standard for classifying and describing rubber compounds (non-oil-resistant) used in automotive applications. Formulations for several white compounds are also included in this bulletin.

Publications of E. I. du Pont de Nemours & Co., Inc., elastomer chemicals department, Wilmington, Del.:

"A Seam Adhesive for Hypalon Coated Fabrics." Report BL-336. J. B. Knox. 4 pages. Seams with high bond strength can be obtained with a neoprene solvent cement containing an organic isocyanate as the active bonding and curing agent. This report describes this new method for joining cured Hypalon-coated fabrics.

"Low Moisture Absorbing Neoprene Cable Jackets for 75° C. Service." Report BL-337. C. E. McCormack and O. L. Simmons. 4 pages. For some types of service, neoprene cable jackets require low moisture absorption together with a service rating up to 75° C. This combination of properties can be obtained by curing with red lead and Thionex, and using a selected combination of antioxidants, softeners, and fillers. A practical stock is shown.

Technical Books

Publications of Dow Corning Corp., Midland, Mich.:

"Silastic Notebook Contents." This contents sheet replaces the one dated November 1, 1957. It lists the names of the company's data sheets, their date, and the tab markings.

"Silastic RTV 501." 9-377a. 2 pages. Silastic RTV 501 vulcanizes at room temperature to form a silicone rubber with excellent resistance to weathering, moisture, heat, and cold. This data sheet lists the advantages, working time, vulcanization, storage, and the physical properties of RTV 501.

"Silastic RTV S-5313 and S-5314." 9-371a. 1 page. These two room-temperature vulcanizing constituents, when stirred together, form a mixture that can be applied by dipping or pouring. Blending and shelf life information is given in addition to some typical properties of the vulcanizate.

"Silastic 7-163." 9-358a. 1 page. This silicone rubber stock is a medium-durometer, low compression stock. Serviceable at temperatures as low as —70° F., it retains excellent physical properties at temperatures in the range of 500° F. Specifications, typical properties, and curing data are given.

"Silastic 8-164." 9-348b. 2 pages. This is a 60-durometer, low compression set, silicone rubber stock serviceable in the same temperature range as Silastic 7-163. It is said to have high mechanical strength, low water absorption, and good dielectric characteristics. It is used to make seals and gaskets, molded parts, tubing, and electrical insulating components. Specifications, typical properties, and curing data are listed.

"Extruding Silastic." 9-222. 6 pages. This data sheet summarizes the techniques used in extruding Silastic compounds and describes the variations in equipment recommended for extruding. Equipment and die design are considered and illustrated with eight figures. Vulcanization of extruded parts is discussed.

Publications of the General Electric Co., silicones products department, Waterford, N. Y.:

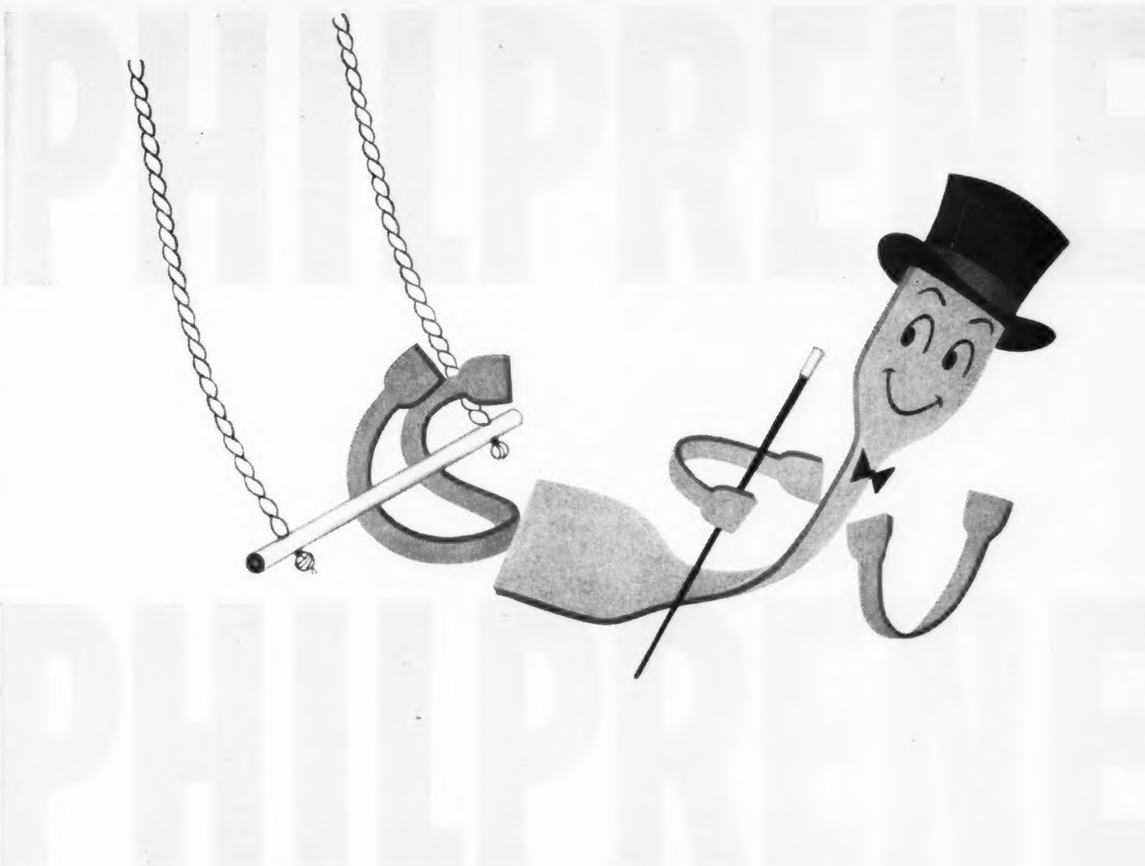
"Class 900 Silicone Rubber—Insulation for Wire and Cable." 4 pages. This bulletin summarizes the electrical properties of Class 900 rubber compounds, all electrical grade materials, and their physical properties. These include heat resistance said to be superior to that of any other rubber, low moisture absorption, formation of non-conducting ash when burned, and superior thermal conductivity.

"Silicones." CDS-129. 8 pages. This catalog discusses the company's major silicone products for which data and descriptions are given. These include rubber, fluids, resins, water repellents, electrical insulation, release agents, lubricants, paint vehicles, and anti-foam agents. It also provides detailed reports about specific silicones and their applications.

"The VC Series: A Complete System of Gravure Inks for Multicolor Printing of Vinyl." TB No. 510. Claremont Pigment Dispersion Corp., Roslyn Heights, L. I., N. Y. 5 pages. This bulletin gives the properties, color, opacity, lightfastness, soap fastness, and suggested uses of the company's new vinyl inks. The data are intended to aid the printer in selecting inks of the proper durability, color, and economy for every application.

"Bulk Handling Shipping Containers." Bulletin 132-A. Sprout, Waldron & Co., Inc., Muncy, Pa. 2 pages. This revised bulletin describes steel, stainless-steel, and aluminum designs on bulk handling individualized shipping containers for railroad or truck shipment of raw and semi-processed materials. Advantages include less floor space, reduced handling, elimination of capping, sealing, labeling, and avoidance of contamination.

"Warehousing—Field Report." No. 114. Hyster Co., Portland, Oreg. 2 pages. This field report shows how a large tire company made improvements in its materials handling system, reflected by lower operating costs and increased profits, by purchasing four Hyster Space Saver cushion-tired trucks with load capacities of 4,000 pounds for stacking, loading, and unloading operations. Pictures of the lift trucks in operation are included.



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COLD	PHILPRENE 1500, PHILPRENE 1502, PHILPRENE 1503	PHILPRENE 1601, PHILPRENE 1605
COLD OIL	PHILPRENE 1703, PHILPRENE 1706, PHILPRENE 1708, PHILPRENE 1712	PHILPRENE 1803, PHILPRENE 1805

Each of the many Philprenes is tops in his act! Philprene 1605, for example, is a star performer in calendering and extrusions. And Philprene 1500 is famous for strength, for superior wear resistance and for outstanding physical properties, too.

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Technical Books

Publications of Lord Mfg. Co., Erie, Pa.:

"Lord Meter Mountings." No. 601. 4 pages. This booklet describes in detail a patented, low-cost, bonded rubber meter mounting for protecting sensitive instruments against shock and vibration. It contains information on the exclusive design features, advantages and performance. Complete meter mounting specifications include a valuable application cross-reference table listing various meter manufacturers' models.

"Lord Traction Motor Nose Supports." Bulletin No. 709. 4 pages. This product bulletin describes a compact, bonded rubber traction motor nose support said to offer protection against shock and vibration encountered in the railroad environment. It contains information on special design features, advantages and performance of the one-piece nose supports. A cross-reference table lists applications on current production models of diesel-electric locomotives.

"Automatic Control of Materials Handling by Weight." No. 0557. Richardson Scale Co., Clifton, N. J. 6 pages. This bulletin discusses how the firm's Select-O-Weigh System provides complete automation in continuous or batch processing operations, including record keeping. Select-O-Weigh controls are discussed, including the Richardson punched-card reader control, a system for fully automatic proportioning and mixing. Eight accessories are described and illustrated. This pamphlet also includes information on three installations and the economy of their operation.

"Aminco 'Equa-Therm' Oven." No. 2299. American Instrument Co., Silver Spring, Md. 4 pages. This bulletin describes the company's new "Equa-Therm" oven, a new high-temperature, high-performance oven which produces temperatures ranging from 100 to 750° F. within a 17-cubic-foot work chamber. A table illustrating temperature differentials shows that the new oven offers point-to-point temperature differentials within the limits never before obtained in commercial ovens of comparable size, according to the manufacturer.

"Bromine—Its Properties and Uses." Michigan Chemical Corp., St. Louis, Mich. 62 pages. This comprehensive booklet covers inorganic bromide reactions, organic bromine reactions, special-purpose bromine-releasing agents, and physical properties of bromine. An extensive bibliography is also included.

Publications of the Office of Technical Services, U. S. Department of Commerce, Washington, D. C.:

"Design of a High-Intensity Gamma Irradiation Facility." PB 131160. M. C. Atkins, WADC, U. S. Air Force. 54 pages. $1.50. This report gives illustrations and details of the Air Force's high-intensity gamma irradiation facility capable of handling 100,000 curries of cobalt-60. The facility is intended for research on effects of radiation on materials. Special drawings and details of construction are included.

"Copolymers, of 1,1,-Dihydroperfluorobutyl Acrylate with Some Vinyl Silanes." E. C. Stump, Jr., WADC, U. S. Air Force. Order PB 131375. August, 1957. 24 pages. 75¢. In this study an elastomer was sought with high-temperature resistance as well as improved resistance to the deteriorating and swelling effects of fuels and oils. Poly-1,1-dihydroperfluorobutyl acrylate was copolymerized with four silane monomers—vinyltriethoxysilane, vinylethyldiethoxysilane, vinyldimethylethoxysilane, and vinyltrimethylsilane. The resulting copolymers exhibited an increase in thermal stability at 350 and 400° F. over the homopolymer. Infrared spectra of the samples are discussed.

"Dilute Solution Techniques for Styrene-Methyl Methacrylate Graft Copolymer and Its Precursors." R. A. Guzzi, Picatinny Arsenal, U. S. Army Ordnance Corps. Order PB 131261. April, 1957. 20 pages. 50¢. It was determined that dilute solution techniques can be adapted to the study of styrene-methyl methacrylate graft copolymers and their precursors. Light-scattering and viscosity measurements of samples of the graft polymers and their precursors were made and analyzed. A quantitative study and interpretation of the data were not feasible.

Publications of The British Rubber Producers' Research Association, Welwyn Garden City, Herts, England:

No. 261. **"New Polymers from Natural Rubber."** L. C. Bateman. 8 pages. This presents a new method for making graft polymers by milling which offers possibilities in both rubber and plastics industries. The special feature of the work reviewed here is emphasis on determining the structure of the products and the understanding of the reactions involved in the chemical modification of natural rubber by synthetic polymers. Attention is given to the preparation of graft polymers from natural rubber and its homologs in solutions and emulsions and to the preparation of block interpolymers from solid rubber by mechanical action.

No. 262. **"Production of Natural Rubber-Synthetic Rubber Interpolymers by Cold Mastication."** D. J. Angier and W. F. Watson. 11 pages. The production of interpolymers on the masticating together of two elastomers in absence of oxygen is predicted from the shear rupture-free radical mechanism of cold mastication. Experimental evidence of the interpolymerization of natural rubber with nitrile, styrene-butadiene, and butadiene rubbers and of neoprene with styrene-butadiene rubbers is presented and briefly discussed.

No. 263. **"Dynamic Shear Properties of Some Rubber-Like Materials."** W. P. Fletcher and A. N. Gent. 8 pages. Measurements are described of the dynamic shear properties of a number of representative rubber-like materials, both vulcanized and unvulcanized, over a wide range of frequencies and temperatures. The major part of the transition from a rubber-like to a glass-like state has been investigated. Reduced values for the real component of the complex shear modulus and the ratio of the imaginary to the real part are presented, enabling the behavior of the materials studied to be evaluated for other frequency and temperature conditions.

No. 264. **"Graft Polymers with Preset Molecular Configurations."** F. M. Merrett. 11 pages. When a graft polymer of rubber and polymethyl methacrylate is dissolved in benzene and a limited amount of methanol added, the hydrocarbon rubber chains collapse to form colloid particles stabilized by the still soluble polymethyl methacrylate chains. In this study similar high solids dispersions of this type and of the complementary type with the vinyl polymer chains collapsed were prepared and evaporated down to give dry modified rubbers. The possibility of predicting the configuration and hence the mechanical properties given by any particular method of preparation is discussed, and examples are given.

No. 265. **"Load-Deflection Relations and Surface Strain Distributions for Flat Rubber Pads."** A. N. Gent. 29 pages. Experimental measurements are described of the load-deflection relations for flat rubber pads in compression. They are shown to be in fair agreement with a simple empirical relation for a wide range of thicknesses and for varied shapes of cross-section. Methods were used to determine the state of strain of the free surfaces of some bonded rubber cylinders subjected to overall compression and extension.

No. 266. **Mastication. V.** Separation and Structural Investigation of Natural Rubber-Polymethyl Methacrylate Formed by Mastication." D. J. Angier and W. F. Watson. 18 pages. Polymerization of methyl methacrylate admixed with natural rubber occurs on rupture of rubber molecules to free radicals by applied shearing forces. The structure of the interpolymers has been investigated by measurement of composition and osmotic molecular weight, ozonolysis to degrade the rubber segments and isolation of the polymethyl methacrylate fragments, autoxidation of the rubber segments, and viscosity measurements on the uncombined rubber.

No. 267. **"Mastication of Rubber. VI.** Viscosity and Molecular Weight Relationships for Natural Rubber after Cold Mastication." D. J. Angier, W. T. Chambers, and W. F. Watson. 10 pages. Values of limiting viscosity number, Huggins' interaction constant, k', osmotic molecular weight and Flory-Huggins' constant, μ, of masticated and unmasticated rubber have been compared. A calibration of limiting viscosity has been obtained for masticated rubber, but not for unmasticated rubber. A mechanism is advanced of rupture during mastication of molecules above a critical molecular weight.

No. 268. **"The Stress Relaxation of Sulfur Vulcanizates."** J. P. Berry and W. F. Watson. 6 pages. This report contains some notes on a recent review article by Tobolsky. The points in question concern the authors' experimental observations and interpretations of chemical stress relaxation of natural rubber as compared with the findings of Tobolsky.

MARKET REVIEWS

Synthetic Rubber

Although synthetic rubber consumption held up well in April, SBR producers cut output significantly, apparently to reduce inventories. Consumption of all types of synthetic rubbers in April amounted to 65,798 long tons, compared with the 66,040 tons consumed in March, but SBR production in April amounted to 59,270 tons, against 69,230 tons in March, according to the regular monthly report of The Rubber Manufacturers Association, Inc.

Also, total new rubber consumption in April at 101,860 tons was not far below the 104,231 tons used in March. Synthetic rubber consumption by types in April, compared to March use, in long tons was reported as: SBR, 54,671, against 54,816; neoprene, 4,722, against 4,965; butyl, 4,590, against 4,297; and nitrile, 1,815, against 1,962. Natural rubber consumption in April amounted to 36,062 tons in contrast to the 38,191 tons for March.

According to some recent surveys made by RUBBER WORLD, SBR producers expect the demand for oil-extended and carbon black masterbatches to increase, and it is evident from the recent activities among producers in announcing new and improved black masterbatches that they feel this market is ready for further development. Consumers appear to be receptive to new black masterbatches now that more evidence is accumulating that they can provide products with physical properties as good or better than their own factory mixed rubber-black masterbatches.

Although SBR producers generally are being squeezed by higher costs and would like to increase prices at least 1¢ a pound, the RUBBER WORLD survey of SBR consumers indicates that any increase in price would cause at least half of them to switch to natural rubber since the prevailing low cost of the latter makes such a move increasingly attractive.

Improvements in existing types of all synthetic rubbers and marketing of new types, together with more and better technical service, are expected to be the synthetic rubber producers approach to maintaining their share of the new rubber market both in this country and abroad.

Natural Rubber

During the April 16-May 15 period the New York natural rubber market followed the general trend in quiet trading frequently described as featureless. Offerings of sheet grades have apparently not been pressing on the market, but lately offers of remills have been lower priced.

The relaxation of the pressure on RSS #1 after the completion of the large Russian order in Malaya did not come as a surprise, according to one source, but as it practically coincided with the virtual collapse of the rebels' resistance in Sumatra and was followed by heavy liquidation, the effect produced revealed the vulnerability of the natural rubber market. In general, prices were reported to be steady in the market, futures and physical. All markets were aided somewhat by reports that in the United Kingdom and in Europe natural prices are in a competitive range with synthetic, and a switch in demand, particularly in the lower grades of natural, is anticipated.

April sales, on the New York Commodity Exchange, amounted to 9,610 tons, compared with 12,700 tons for March Contract. There were 21 trading days in April and 22 during the April 16-May 15 period.

On the physical market, RSS #1, according to the Rubber Trade Association of New York, averaged 25.67¢ per pound for the April 16-May 15 period. Average April sellers' prices for representative grades were: RRS #3, 23.86¢; #3 Amber Blankets, 22.37¢; and Flat Bark, 19.41¢.

Latex

During the April 16-May 15 period the latex market followed the movements in the natural rubber market, and values have been marked down accordingly. At the lower levels some buying of reasonable quantities was reported, but the resultant offtake was insufficient to offer any encouragement for an improvement in the present uncertain conditions.

One source expressed the belief that it will be necessary for the stock position to right itself before an improvement in the present extremely low premium on liquid latex can be expected. It was indicated, however, that some producers have already taken steps to switch their production from liquid to dry rubber.

Prices for ASTM Centrifuged Concentrated natural latex, in tank-car quantities, f.o.b., rail tank car, ran about 33.47¢ per pound solids. Synthetic latices prices were 22.5 to 31.2¢ for SBR; 37 to 55¢ for neoprene; and 46 to 65¢ per pound for nitrile types.

Final February and preliminary March domestic statistics for all latices were reported by the United States Department of Commerce as:

(All Figures in Long Tons, Dry Weight)

Type of Latex	Production	Imports	Consumption	Month-End Stocks
Natural				
Feb.	0	....	5,380	15,506
Mar.	0	....	5,560	16,825
SBR				
Feb.	3,852	—	4,475	7,992
Mar.	4,880	—	4,708	7,991
Neoprene				
Feb.	765	0	640	1,251
Mar.	759	0	633	1,281
Nitrile				
Feb.	671	0	906	2,297
Mar.	787	0	720	1,974

REX CONTRACT

1958	Apr. 18	Apr. 25	May 2	May 9	May 16
May	26.90	25.50	24.85	25.25	24.95
July	26.82	25.50	25.25	25.55	25.50
Sept.	26.80	25.45	25.25	25.50	25.45
Nov.	26.72	25.40	25.15	25.49	25.45
1959					
Jan.	26.65	25.30	25.10	25.40	25.40
Mar.	26.55	25.30	25.10	25.40	25.35
May	26.55	25.30	25.10	25.40	25.35
Total weekly sales, tons	1,470	3,820	4,470	2,310	2,110

NEW YORK OUTSIDE MARKET

	Apr. 18	Apr. 25	May 2	May 9	May 16
RSS #1	26.88	25.63	25.25	25.50	25.50
2	25.63	24.50	24.50	24.63	24.63
3	24.25	22.88	22.63	23.50	23.38
Pale Crepe					
#1 Thick	27.75	26.38	26.75	27.50	27.50
Thin	28.25	26.88	26.75	27.50	27.50
#3 Amber Blankets	22.63	21.63	20.50	20.75	20.63
Thin Brown Crepe	22.25	21.00	19.75	20.00	19.75
Standard Bark Flat	19.50	18.63	18.50	18.63	18.50

Market Reviews

Rayon

Total packaged production of rayon and acetate filament yarn during April was 50,800,000 pounds, consisting of 20,500,000 pounds of high-tenacity rayon yarn and 30,300,000 pounds of regular-tenacity rayon yarn. For March production had been: total, 54,600,000 pounds, including regular-tenacity rayon yarn, 31,300,000; high-tenacity rayon yarn, 23,300,000.

Filament yarn shipments to domestic consumers for April totaled 47,200,000 pounds, of which 17,200,000 pounds were high-tenacity rayon yarn and 30,000,000 were regular-tenacity rayon yarn. March shipments had been: total, 53,800,000 pounds; high-tenacity, 22,800,000 pounds; regular-tenacity, 31,000,000 pounds.

Stocks on April 30 totaled 72,300,000 pounds, made up of 20,300,000 pounds of high-tenacity rayon yarn and 52,000,000 pounds of regular-tenacity rayon yarn. End-of-March had been: total, 69,800,000 pounds; high-tenacity rayon yarn, 17,600,000 pounds; regular-tenacity yarn, 52,200,000 pounds.

RAYON PRICES

Tire Fabrics	
1100/490/2	$0.69 /$0.73
1650/908/2	.63 / .725
2200/980/2	.625/ .655
Tire Yarns	
High-Tenacity	
1100/ 490, 980	.50/ .64
1100/ 490	.59/ .63
1150/ 490, 980	.59/ .63
1165/ 480	.59/ .65
1230/ 490	.59/ .63
1650/ 720	.55/ .58
1650/ 980	.55/ .58
1875/ 980	.55/ .58
2200/ 960	.54/ .57
2200/ 980	.54/ .57
2200/1466	.64
4400/2934	.60
Super-High Tenacity	
1650/ 720	.58
1900/ 720	.58

Industrial Fabrics

Increased activity developed in wide industrial fabrics during the April 16-May 15 period, with vinyl plastic coaters purchasing sizable yardages of sateens and broken twill fabrics for spot and nearby delivery.

Though the volume of buying could not be considered sensational it still was substantial enough, according to trade sources, to represent a considerable improvement in sales compared to the sluggish market which has prevailed this year. The buying of wide goods for quick delivery recently is the first flurry this market has seen since the fall of last year, it was stated.

Trading remained quite slow in some other industrial goods, including drills and sheetings. It was reported that ducks sold only in limited quantities during the close of this period and for prompt shipment

INDUSTRIAL FABRICS

Drills	
59-inch 1.85 yd. .... *yd.*	$0.335/.34
2.25-yd.	.285/.29
Ducks	
38-inch 1.78-yd. S.F. .... *yd.*	nom.
2.00-yd. D.F.	.30
51.5-inch, 1.35-yd. S.F. .. *yd.*	....
Hose and belting	.63
Osnaburgs	
40-inch 2.11-yd. .... *yd.*	.2275
3.65-yd.	.1525
Raincoat Fabrics	
Printcloth, 38½-in., 64-60,	
5.35-yd. .... *yd.*	.1325
6.25-yd.	.1165
Sheeting, 48-inch, 4.17-yd.	.20
52-inch, 3.85-yd.	.2275
Chafer Fabrics	
14.40-oz./sq. yd. Pl. .... *yd.*	.73
11.65-oz./sq. yd. S.	.61
10.80-oz./sq. yd. S.	.6575
8.9-oz./sq. yd. S.	.67
Other Fabrics	
Headlining, 59-in., 1.65-yd.,	
2-ply .... *yd.*	.41
64-inch, 1.25-yd., 2-ply	.59
Sateens, 58-inch, 1.32-yd.	.52/.525
58-inch, 1.21-yd.	.5675

Scrap Rubber

The scrap rubber market during the period under review showed no signs of increased activity. It was reported that the Naugatuck reclaimer was expected to close down for at least another week in May, most likely the last week of the month. This reclaimer has not been taking in any mixed auto tires, and the price of $11.00 for this grade is applicable in the East only on the shipments to Buffalo.

	Eastern Points	Akron, O.
	Per Net Ton	
Mixed auto tires	$11.00	$12.00
S. A. G. truck tires	nom.	15.50
Peeling, No. 1	nom.	23.00
2	nom.	20.00
3	nom.	15.50
Tire buffings	nom.	nom.
	(¢ per Lb.)	
Auto tubes, mixed	2.50	2.75
Black	6.25	6.25
Red	6.25	6.25
Butyl	3.50	3.625

Reclaimed Rubber

The period between April 16-May 15 showed some pickup in the reclaimed rubber business, and according to one source, the outlook for the balance of May looked fairly good though it was stated that business is still slower than usual.

Although the synthetic rubbers have developed more intense competition, the reclaimed rubber industry has found that its unique elastomer is still needed for the same reason—better processing. The usage of reclaimed rubber has not fallen off directly in line with automotive sales, owing, perhaps, to an increase in replacement tire business. The usual seasonal drop-off during the summer is expected.

According to The Rubber Manufacturers Association, Inc., report, April production of reclaimed rubber reached 18,800 tons; while consumption was 19,700 long tons.

RECLAIMED RUBBER PRICES

Whole tire, first line	$0.115
Third line	.11
Inner tube, black	.16
Red	.21
Butyl	.14
Light carcass	.22
Mechanical, light-colored, medium gravity	.155
Black, medium gravity	.085

The above list includes those items or classes only that determine the price basis of all derivative reclaim grades. Every manufacturer produces a variety of special reclaims in each general group separately featuring characteristic properties of quality, workability, and gravity, at special prices.

Obituaries

(Continued from page 457)

of Illinois. Then he joined Montgomery-Ward in Chicago, Ill. In succeeding years he held important marketing and advertising positions with the *Cleveland Press, Cincinnati Post,* and *Good-Housekeeping* magazine.

Mr. Wood was well known to many tire dealers throughout the country. Recently he was one of the principal speakers at the California State Tire Dealers Convention in Fresno, Calif., and had attended NTDRA's Regional Conference in Palm Springs, Calif.

A memorial service was held May 23 at Round Hill Community Church, Greenwich, Conn.

The deceased is survived by his wife, a son, a daughter, a sister, and six grandchildren.

Frank B. Ward

Frank B. Ward, one of the oldest employes in length of service of American Biltrite Rubber Co., Chelsea, Mass., passed away May 19 at his home after a short illness. Mr. Ward was purchasing agent and assistant secretary of the company.

He was born in Stoughton, Mass., 61 years ago and was graduated from the Stoughton schools.

In 1914 he went to work for American Biltrite at its Stoughton plant and worked continuously for the company since that time, moving to its main office in Chelsea in 1932.

He leaves his wife, a son, and a sister.

News from Abroad

(Continued from page 460)

Netherlands

Two Synthetic Plants

The B. F. Goodrich Chemical Co. and the A. K. U. (Algemeene Kunststof Unie), of Arnheim, Holland, have jointly formed a new company to produce special-purpose synthetic rubber in Holland, it is learned. Among the products to be made will be Hycar nitrile rubber (NBR) latex. A new plant is to be built and is scheduled for operation by mid-1959; it will be the first factory on the European continent to use the Goodrich technique for synthetic rubber.

At the same time it has been reported that the Royal Shell Group, which has for some time been considering plans to establish a factory for the production of synthetic rubber in Holland, has now decided to put these plans into effect. The N. V. De Bataafsche Petroleum Mij. will build a factory at Pernis, near Rotterdam, with an annual initial capacity of at least 50,000 tons of general-purpose, presumably styrene-butadiene (SBR), rubber.

East Germany

Four-Company Combine

The four East German rubber manufacturing concerns, Gummiwerk Elastic Gotha, Thuringer Schlauch-und Gummiwerke Waltershausen, Gummiwerk Gothania Horselgau, and Gummiwerk Tabarz, all in the Gotha district of Thuringia, recently joined to form what is said to be the biggest socialist rubber combine in East Germany. By this step the companies, which together employ about 4,500 persons, expect to be able to increase combined output by 1960 from the present annual value of 116,000,000 East German marks, to 129,000,000 E. G. marks. The individual concerns will retain their own trade marks and continue to keep separate accounts, but their production programs will be planned together.

North Borneo

A new replanting cess of 3⅓% on the customs value of every pound of rubber exported from North Borneo went into effect December 1, 1957. The new levy was imposed to help finance the provision of planting materials to smallholders under the scheme introduced two years ago to encourage replanting with new high-yielding materials.

STATISTICS

of the RUBBER INDUSTRY

U.S.A. Imports and Production of Natural (Including Latex and Guayule) and Synthetic Rubber (in Long Tons)

Year	Natural	GR-S	SBR Types	Butyl	Neoprene	N-Type	Total Natural and Synthetic
1955	637,577	236,556	564,589	56,179	91,357	32,623	1,616,478
1956	579,217	....	877,430	75,922	99,412	34,567	1,667,841
1957							
Jan.	46,349	....	76,224	6,366	9,432	2,893	141,264
Feb.	37,487	....	66,023	5,664	9,004	2,894	121,072
Mar.	40,680	....	76,546	6,460	8,031	3,291	135,008
Apr.	59,896	....	65,706	5,890	8,902	2,408	142,802
May	52,566	....	77,542	6,145	9,235	2,561	148,049
June	30,290	....	68,297	4,474	9,678	2,538	137,553
July	44,760	....	67,796	1,972	8,591	2,592	125,711
Aug.	48,951	....	76,197	5,455	9,033	2,737	142,373
Sept.	47,937	....	75,872	6,113	9,726	2,826	142,474
Oct.	49,371	....	87,709	6,085	9,545	3,062	155,772
Nov.	44,583	....	87,152	6,099	9,976	2,803	148,362
Dec.	53,922	....	85,223	6,469	9,568	2,519	157,701
Total	553,043	....	907,534	66,936	110,721	33,124	1,671,358
1958							
Jan.	45,564	....	85,379	6,149	8,804	2,384	148,280
Feb.	52,546	....	66,402	4,996	8,200	2,157	134,301
Mar.*	....	....	69,230	4,698	7,671	2,042	....

*Preliminary. Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

U.S.A. Consumption of Natural (Including Latex) and Synthetic Rubber (Long Tons)

Year	Natural	GR-S	SBR Types	Butyl	Neoprene	N-Type	Total Natural and Synthetic
1955	634,800	234,963	507,034	53,991	72,876	26,035	1,529,699
1956							
Jan.	53,751	....	65,375	4,223	6,684	2,198	132,231
Feb.	50,285	....	62,366	4,155	6,430	2,289	125,525
Mar.	50,040	....	64,458	4,515	6,542	2,373	127,928
Apr.	47,446	....	62,179	4,228	6,125	2,150	122,128
May	48,342	....	63,629	4,285	6,379	2,103	124,738
June	43,638	....	56,390	4,026	5,536	1,864	111,454
July	38,353	....	48,907	3,316	4,435	1,538	96,549
Aug.	46,700	....	59,756	4,102	6,554	2,125	119,237
Sept.	44,179	....	57,135	4,044	6,057	1,969	113,384
Oct.	52,188	....	67,399	4,780	7,478	2,366	134,211
Nov.	42,946	....	58,692	4,093	6,676	2,065	114,472
Dec.	45,220	....	60,742	3,814	5,956	1,893	117,625
Yr.-end adj.	−1,000	....	−3,000	....	....	+1,000	−3,000
Total	562,088	....	724,028	49,581	74,852	25,933	1,436,482
1957							
Jan.	52,631	....	70,978	5,028	7,237	2,247	138,121
Feb.	46,427	....	64,322	4,581	6,235	2,122	123,687
Mar.	48,263	....	67,853	4,998	6,559	2,240	129,913
Apr.	45,368	....	63,280	4,651	6,295	2,129	121,723
May	46,385	....	66,774	4,902	6,441	2,125	126,753
June	41,282	....	58,479	4,198	5,816	1,963	111,738
July	39,683	....	58,021	4,146	5,231	1,646	108,833
Aug.	44,846	....	66,089	4,461	6,502	2,220	124,204
Sept.	43,527	....	64,505	4,654	6,351	2,141	121,326
Oct.	48,782	....	73,850	5,343	7,194	2,433	137,602
Nov.	43,816	....	62,635	4,521	6,136	2,110	119,218
Dec.	38,285	....	56,432	3,930	5,464	1,811	105,922
Total	538,761	....	767,218	55,813	75,661	25,187	1,462,640
1958							
Jan.	42,597	....	60,179	4,508	5,928	2,010	115,222
Feb.	36,711	....	52,962	4,255	5,045	1,968	100,941
Mar.*	38,191	....	54,816	4,297	4,965	1,962	104,231

* Preliminary. Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

U.S.A. Stocks of Latex

(Long Tons, Dry Weight)

Year	Natural	GR-S*	Neoprene	N-Type	Total Synthetic	Total Natural & Synthetic
1956	12,262	7,327	1,421	2,217	10,965	23,227
1957						
Jan.	11,831	7,191	1,329	1,936	10,456	22,287
Feb.	9,940	7,415	1,169	2,051	10,635	20,575
Mar.	10,173	7,689	1,170	2,157	11,016	21,189
Apr.	12,064	8,096	1,183	1,836	11,115	23,179
May	11,733	7,885	1,407	1,710	11,002	22,735
June	10,931	8,139	1,377	2,001	11,517	22,448
July	12,073	8,045	1,296	1,953	11,294	23,367
Aug.	13,535	7,997	1,309	1,545	10,851	24,386
Sept.	12,315	7,566	1,141	1,700	10,407	23,722
Oct.	12,399	7,254	1,142	1,723	10,119	22,518
Nov.	12,316	7,558	1,265	1,927	10,750	23,066
Dec.	14,454	8,347	1,367	2,374	12,088	26,542
1958						
Jan.	14,178	8,222	1,190	2,052	11,464	25,642
Feb.	15,506	7,992	1,251	2,297	11,540	27,046
Mar.†	16,825	7,991	1,281	1,974	11,246	28,071

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.
*Includes SBR Types.
† Preliminary.

U.S.A. Consumption of Natural and Synthetic Latices

(Long Tons, Dry Weight)

Year	Natural	GR-S*	Neoprene	N-Type	Total Synthetic	Total Natural & Synthetic
1956	73,100	65,380	8,733	8,934	83,047	156,147
1957						
Jan.	6,994	6,288	856	841	7,985	14,979
Feb.	6,398	5,894	758	708	7,360	13,758
Mar.	7,081	6,370	784	799	7,953	15,034
Apr.	6,434	5,554	772	710	7,036	13,470
May	5,867	5,114	814	731	6,659	12,526
June	5,445	4,790	736	610	6,136	11,681
July	5,180	4,269	677	480	5,426	10,606
Aug.	6,499	5,758	784	823	7,365	13,864
Sept.	6,645	5,676	712	753	7,141	13,786
Oct.	7,250	6,556	788	857	8,201	15,451
Nov.	6,783	5,776	725	712	7,213	13,996
Dec.	5,933	5,260	633	606	6,499	12,432
Total	75,009	68,305	9,539	10,230	88,074	163,083
1958						
Jan.	6,380	5,438	806	683	6,927	13,307
Feb.	5,380	4,475	640	806	5,921	11,301
Mar.†	5,560	4,708	633	720	6,061	11,621

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.
*Includes SBR Types.
† Preliminary.

U.S.A. Exports of Synthetic Rubber

(Long Tons)

Year	SBR Types	Butyl	Neoprene	N-Type	Total
1956	112,526	8,699	21,909	6,194	149,328
1957					
Jan.	13,989	207	2,500	540	17,236
Feb.	13,353	439	2,505	482	16,779
Mar.	13,664	1,014	2,466	781	17,925
Apr.	10,625	372	2,244	620	13,861
May	12,208	603	2,480	517	15,808
June	13,886	762	2,315	492	17,455
July	14,444	1,169	3,426	631	19,670
Aug.	13,795	758	2,786	478	17,817
Sept.	11,625	540	1,964	396	14,525
Oct.	12,200	1,261	2,588	467	16,516
Nov.	12,639	809	2,521	410	16,379
Dec.	15,549	814	2,447	563	19,373
Total	158,017	8,832	30,242	6,377	203,468
1958					
Jan.	14,109	1,626	2,649	513	18,897
Feb.	9,947	1,415	2,626	378	14,366

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

U.S.A. Stocks of Synthetic Rubber

(Long Tons)

Year	SBR Types	Butyl	Neoprene	N-Type	Total
1956	151,934	28,685	14,043	8,184	202,846
1957					
Jan.	143,177	29,810	13,073	7,664	193,724
Feb.	134,587	29,951	12,705	7,565	184,808
Mar.	131,255	30,814	11,949	7,795	181,813
Apr.	122,764	31,536	12,064	7,247	173,611
May	121,638	31,812	13,010	6,981	173,441
June	120,694	31,569	13,822	7,085	173,170
July	113,143	28,208	15,172	7,125	163,648
Aug.	111,962	28,339	14,603	6,784	161,688
Sept.	109,417	29,132	14,751	7,207	160,507
Oct.	113,382	29,008	15,181	7,134	164,705
Nov.	124,432	29,702	16,453	7,380	177,967
Dec.	140,199	31,489	18,943	7,954	198,585
1958					
Jan.	152,441	31,753	18,691	7,512	210,397
Feb.	151,501	31,369	18,408	7,635	208,914
Mar.*	153,221	30,796	18,504	6,947	209,468

Source: Bureau of Census, Industry Division Chemicals Branch, United States Department of Commerce.
*Preliminary.

U.S.A. Imports and Production of Natural and Synthetic Latices

(Long Tons, Dry Weight)

Year	Natural	GR-S*	Neoprene	N-Type	Total Synthetic	Total Natural & Synthetic
1956	71,718	69,762	10,642	10,650	91,054	162,772
1957						
Jan.	6,460	7,228	905	960	9,093	15,553
Feb.	4,342	6,481	724	1,035	8,240	12,582
Mar.	5,856	7,227	924	1,127	9,278	15,134
Apr.	8,812	6,306	976	881	8,163	16,975
May	5,794	5,495	1,082	933	7,510	13,304
June	4,809	5,251	819	886	6,956	11,765
July	6,243	4,646	572	844	6,062	12,305
Aug.	6,834	6,816	874	608	8,298	15,132
Sept.	5,516	5,649	917	1,285	7,851	15,268
Oct.	8,351	6,876	885	1,133	8,894	14,811
Nov.	6,496	6,515	1,021	994	8,530	15,026
Dec.	7,572	5,915	704	734	7,353	14,925
Total	69,513	74,405	10,403	11,637	96,445	165,958
1958						
Jan.	6,289	5,998	788	785	7,571	....
Feb.	6,485	3,852	765	671	5,288	13,860
Mar.†	....	4,880	759	787	6,426	11,773

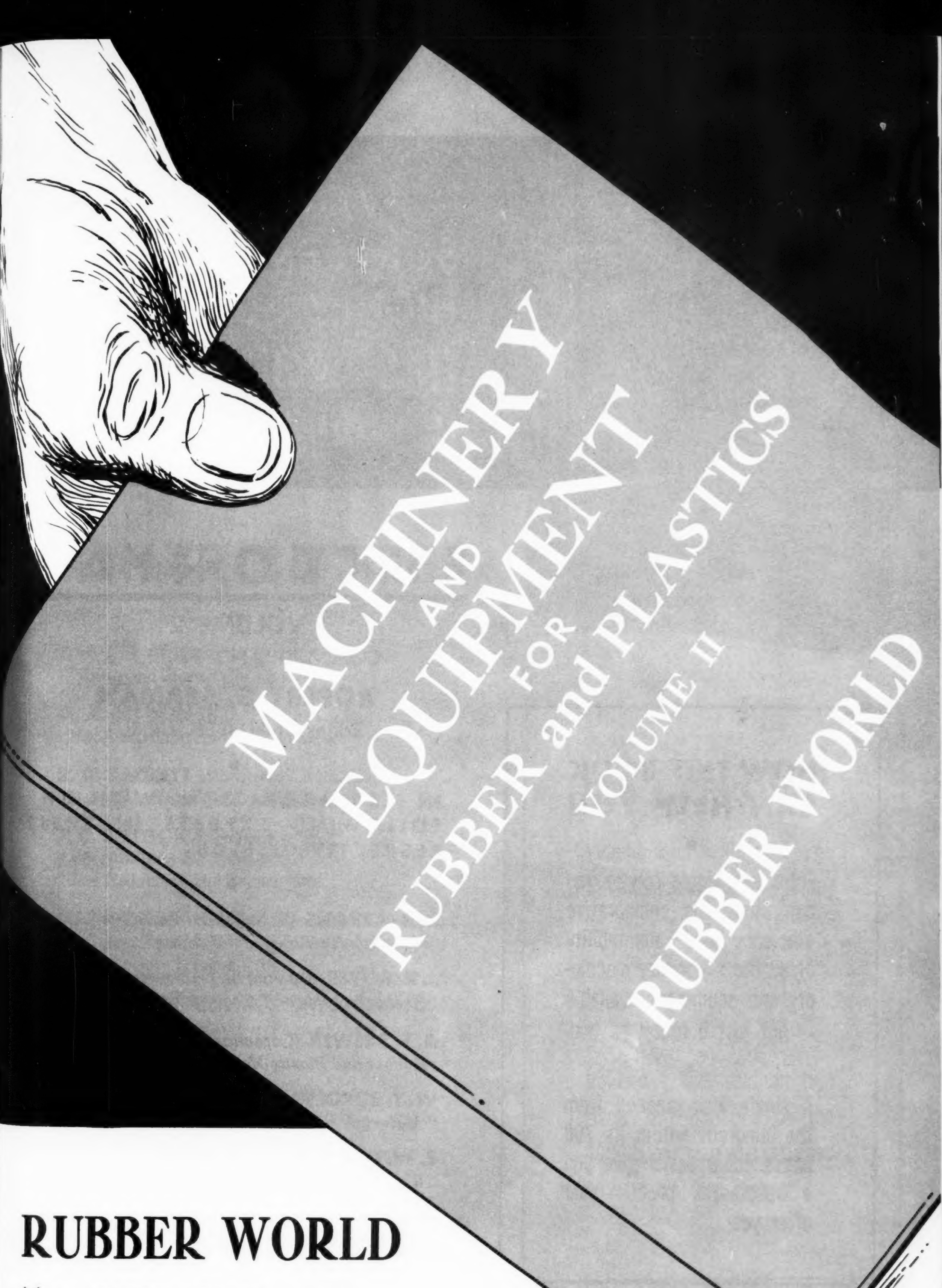
Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.
*Includes SBR Types.
† Preliminary.

U.S.A. Automotive Inner Tubes

(Thousands of Units)

	Shipments					
Year	Original Equipment	Replacement	Export	Total	Production	Inventory End of Period
1956	3,101	32,358	1,041	36,499	34,407	6,109
1957						
Jan.	274	3,263	72	3,608	2,918	6,294
Feb.	267	2,964	61	3,292	3,362	5,960
Mar.	240	3,057	100	3,397	3,822	6,540
Apr.	311	2,708	85	3,104	3,428	6,969
May	301	2,827	86	3,214	3,548	7,422
June	275	3,141	69	3,485	3,025	6,946
July	258	3,364	86	3,708	2,941	6,287
Aug.	243	3,358	81	3,683	3,134	5,966
Sept.	213	3,180	90	3,483	3,365	6,174
Oct.	242	2,809	121	3,172	3,764	6,909
Nov.	259	2,468	65	2,792	2,585	6,250
Dec.	225	2,392	101	2,717	2,778	7,671
Total	3,045	35,684	1,077	39,806	39,763	
1958						
Jan.	232	4,005	71	4,309	3,344	6,699
Feb.	209	3,014	73	3,296	3,443	6,983
Mar.	209	3,481	74	3,764	3,685	7,066

Source: The Rubber Manufacturers Association, Inc.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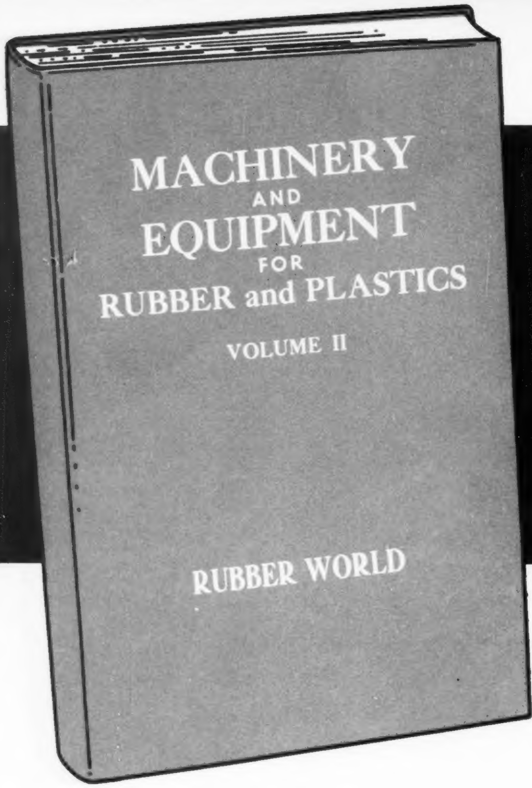

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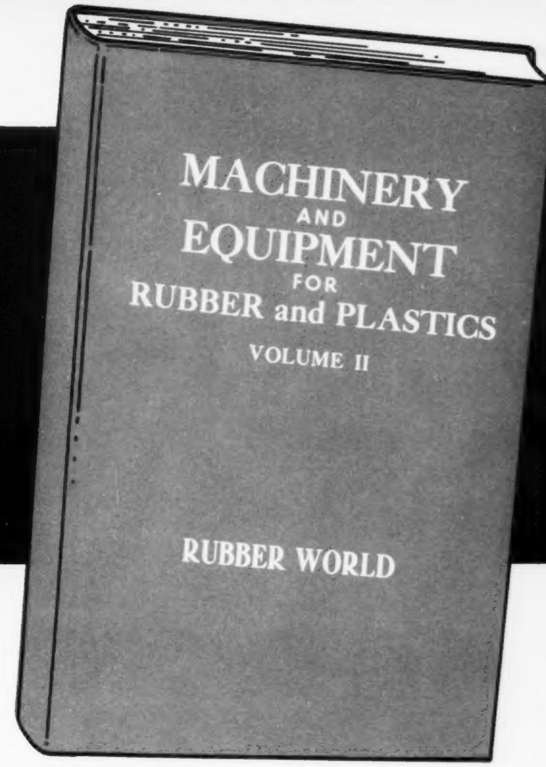

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O. A. MARTIN (U. S. Rubber Co.)
"Materials Handling . . . Footwear"

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World Production of Natural Rubber

(1,000 Long Tons)

	Malaya		Indonesia			
Year	Estate	Native	Estate	Native	All Other	Total
1953	341.8	232.6	301.8	390.4	458.4	1,725.0
1954	343.5	240.8	280.5	464.3	473.4	1,802.5
1955	352.9	286.2	261.3	472.4	521.2	1,895.0
1956						
Jan.	32.6	26.5	23.7	17.7	49.5	150.0
Feb.	27.6	24.3	23.0	21.0	41.6	137.5
Mar.	28.5	22.5	21.5	16.9	43.0	132.5
Apr.	26.7	21.7	20.0	46.1	40.4	155.0
May	23.5	19.8	18.0	38.4	42.9	142.5
June	29.5	23.2	21.9	25.7	47.0	147.5
July	30.8	23.9	21.3	41.3	47.6	165.0
Aug.	30.3	23.0	20.3	64.0	49.9	187.5
Sept.	30.2	21.9	21.3	28.8	42.7	145.0
Oct.	30.5	22.5	22.0	34.0	58.5	167.5
Nov.	28.4	21.3	21.9	44.0	54.1	170.0
Dec.	34.7	24.2	23.0	49.2	56.1	187.5
Total	353.0	274.4	259.0	427.8	532.9	1,887.5
1957						
Jan.	36.1	27.3	23.8	22.7	45.1	155.0
Feb.	27.1	22.1	20.6	16.4	38.8	125.0
Mar.	26.0	21.1	19.7	46.1	52.2	165.0
Apr.	26.6	22.5	19.6	41.6	39.8	150.0
May	27.2	18.3	18.1	30.4	43.5	137.5
June	29.7	21.6	20.4	29.5	43.8	145.0
July	32.5	24.1	21.0	65.9	46.5	192.5
Aug.	33.0	23.2	21.8	52.4	44.8	175.0
Sept.	31.5	21.4	21.8	37.8	35.0	157.5
Oct.	33.4	22.6	22.2	32.8	54.0	165.0
Nov.	34.4	22.7	22.2	24.5	51.2	155.0
Dec.	32.4	22.1	21.1	32.4	62.0	170.0
Total	369.8	268.9	252.2	432.3	556.7	1,892.5
1958						
Jan.	35.8	25.4	22.5	11.5	52.5	145.0
Feb.	28.8	22.9	20.0	8.8	37.0	117.5

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce; Secretariat of the International Rubber Study Group.

World Consumption of Natural Rubber

(1,000 Long Tons)

Year	United States	Eastern Europe and China	United Kingdom	Other Foreign	Total Foreign	Grand* Total
1953	553.5	101.9	206.6	753.0	1,061.5	1,615.0
1954	597.5	62.7	226.5	835.7	1,124.9	1,725.0
1955	634.8	56.2	246.3	900.2	1,202.7	1,837.5
1956						
Jan.	53.7	19.1	21.7	68.8	109.6	162.5
Feb.	50.2	28.2	17.9	63.2	109.3	160.0
Mar.	50.0	23.1	16.0	71.4	110.5	160.0
Apr.	47.4	22.7	18.4	70.1	111.2	160.0
May	48.3	27.0	14.5	68.6	110.1	157.5
June	43.6	30.0	16.1	73.8	119.9	162.5
July	38.3	23.4	14.7	70.9	109.0	147.5
Aug.	46.6	13.9	10.3	64.9	89.1	135.0
Sept.	44.1	25.1	14.5	73.5	113.1	157.5
Oct.	52.1	17.5	18.8	78.3	114.6	167.5
Nov.	43.0	32.0	15.7	72.1	119.8	162.5
Dec.	45.1	34.0	14.3	66.5	114.8	160.0
Total	562.1	295.0	192.8	841.7	1,330.4	1,892.5
1957						
Jan.	52.6	13.0	14.4	74.9	102.3	155.0
Feb.	46.4	19.9	14.5	72.7	107.1	152.5
Mar.	48.3	23.6	17.6	72.7	113.9	162.5
Apr.	45.4	32.2	13.6	76.6	122.4	167.5
May	46.5	10.3	14.5	79.3	104.1	150.6
June	41.3	25.4	17.2	74.8	117.4	158.7
July	39.7	25.3	14.0	76.2	115.5	155.0
Aug.	44.9	28.0	9.7	66.8	104.5	150.0
Sept.	43.7	18.7	18.1	78.4	115.2	157.5
Oct.	48.8	12.2	15.3	75.7	106.2	155.0
Nov.	43.8	19.2	15.1		108.8	152.5
Dec.	38.3	18.5	17.7	70.8	104.2	142.5
Total	539.8	263.5	181.6	885.5	1,330.2	1,870.0
1958						
Jan.	42.6	...	15.3	...	...	152.5
Feb.	36.7	...	16.1	...	...	155.0

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce; and Secretariat of the International Rubber Study Group.
*Estimated.

World Production of Synthetic Rubber

(1,000 Long Tons)

Year	U.S.A.	Canada	Germany	Total
1953	848.4	80.9	6.3	935.6
1954	622.9	86.6	6.9	716.4
1955	970.5	103.9	10.9	1,085.3
1956				
Jan.	93.5	9.7	1.0	104.3
Feb.	90.5	8.2	1.0	99.7
Mar.	94.4	10.3	1.1	105.8
Apr.	91.6	10.3	1.0	102.8
May	93.7	10.6	1.0	105.3
June	85.3	10.4	0.6	96.3
July	88.0	8.7	1.0	97.7
Aug.	86.5	10.2	0.9	97.6
Sept.	90.6	10.7	0.8	102.1
Oct.	88.2	10.7	0.8	99.7
Nov.	83.5	10.3	0.8	94.7
Dec.	93.8	10.6	0.8	105.2
Total	1,079.6	120.7	10.7	1,211.0
1957				
Jan.	94.3	11.1	0.9	106.2
Feb.	83.2	9.8	1.1	94.1
Mar.	93.9	11.1	1.1	106.1
Apr.	82.3	11.0	1.0	94.3
May	95.0	11.5	0.8	107.3
June	84.4	11.3	1.1	96.8
July	81.0	10.1	0.8	91.9
Aug.	93.4	11.0	1.1	105.6
Sept.	94.5	10.9	1.0	106.4
Oct.	106.4	11.4	1.1	118.9
Nov.	106.0	11.5	1.0	118.5
Dec.	103.8	11.5	0.6	115.9
Total	1,118.3	132.1	11.6	1,262.0
1958				
Jan.	102.7	10.9	1.8	115.4
Feb.	81.8	9.1	...	....

Source: Secretariat of the International Rubber Study Group; and Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.

World Consumption of Synthetic Rubber*

(1,000 Long Tons)

Year	U.S.A.	Canada	United Kingdon	Total† Continent of Europe	World† Grand Total
1953	784.8	35.9	4.9	39.3	872.5
1954	636.7	30.1	8.7	50.8	740.0
1955	894.9	40.2	20.5	78.3	1,057.5
1956					
Jan.	78.5	4.0	3.1	9.0	100.0
Feb.	75.2	4.1	3.1	9.0	95.0
Mar.	78.3	4.1	3.1	9.0	97.5
Apr.	73.7	4.4	3.6	8.8	97.5
May	76.4	4.5	3.2	8.5	97.5
June	67.8	4.0	3.6	9.5	90.0
July	58.2	3.7	2.9	8.8	80.0
Aug.	72.5	3.3	2.3	7.5	90.0
Sept.	69.2	3.9	3.2	9.0	90.0
Oct.	82.0	4.2	4.1	10.8	105.0
Nov	71.5	4.3	3.9	10.5	95.0
Dec.	73.3	3.8	3.6	9.8	97.5
Total	877.3	48.4	39.5	110.5	1,135.0
1957					
Jan.	85.5	4.4	3.7	11.5	110.0
Feb.	77.9	4.2	3.9	11.3	102.5
Mar.	81.7	4.3	5.4	11.5	110.0
Apr.	76.4	4.2	4.0	12.3	102.5
May	80.2	4.7	4.8	12.5	107.5
June	70.5	4.2	5.5	12.3	97.5
July	69.0	3.5	4.3	14.0	97.5
Aug.	79.3	2.8	3.0	11.2	102.5
Sept.	77.7	3.7	6.4	14.0	110.0
Oct.	88.8	4.1	5.5	14.8	120.0
Nov.	75.4	4.0	5.0	14.0	105.0
Dec.	67.6	3.6	6.0	13.3	95.0
Total	929.3	47.5	57.4	154.8	1,262.5
1958					
Jan.	72.6	3.5	5.2	14.8	102.5
Feb.	64.2	3.5	5.2	...	92.5

Source: Secretariat of the International Rubber Study Group; Bureau of the Census, Industry Division, Chemical Branch, United States Department of Commerce.
* Includes latices.
† Figures estimated or partly estimated.

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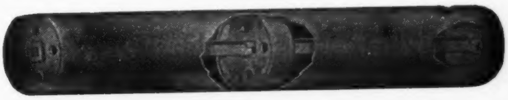

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Carbon Black Statistics—First Quarter 1958

Furnace blacks are classified as follows: SRF, semi-reinforcing furnace black; HMF, high modulus furnace black; GPF, general-purpose furnace black; FEF, fast-extruding furnace black; HAF, high abrasion furnace black; SAF, super abrasion furnace black; ISAF, intermediate super abrasion furnace black.

(Thousands of Pounds)

	Jan.	Feb.	Mar.
Production			
Furnace types			
Thermal	12,159	10,070	11,942
SRF	22,704	17,946	18,714
HMF	5,769	3,190	5,242
GPF	4,470	4,852	4,632
FEF	16,992	16,398	18,272
HAF	39,384	32,054	33,735
SAF	—	728	968
ISAF	13,888	14,739	16,522
Total furnace	115,330	99,977	110,027
Contact types	28,574	25,712	27,328
Totals	143,904	125,689	137,355
Shipments			
Furnace types			
Thermal	12,237	8,648	8,762
SRF	21,706	18,360	19,869
HMF	5,320	5,030	4,355
GPF	5,589	4,793	3,721
FEF	17,609	17,285	16,780
HAF	35,550	32,938	34,433
SAF	531	387	560
ISAF	359	12,590	14,332
Total furnace	901	100,031	102,812
Contact types	25,571	23,072	23,617
Totals	138,472	123,303	126,429
Producers' Stocks, End of Period			
Furnace types			
Thermal	20,086	21,508	24,688
SRF	75,022	74,608	73,453
HMF	10,674	8,834	9,721
GPF	8,409	8,468	9,379
FEF	32,930	32,043	33,535
HAF	57,104	56,220	55,522
SAF	7,388	7,729	8,137
ISAF	49,406	51,555	53,745
Total furnace	261,019	260,965	268,180
Contact types	83,776	86,216	89,927
Totals	344,795	347,181	358,107
Exports			
Furnace types			
Total furnace	23,723	22,719	....
Contact types	13,519	10,933	....
Totals	37,242	33,652	....

Source: Bureau of Mines, United States Department of the Interior, Washington, D. C.

U.S.A. Synthetic Rubber Industry, Wages, Hours

Year	Average Weekly Earnings	Average Weekly Hours	Average Hourly Earnings
1956	103.50	41.4	2.50
Oct.	107.52	42.0	2.56
Nov.	103.57	41.1	2.52
Dec.	107.33	41.6	2.58
1957			
Jan.	106.30	41.2	2.58
Feb.	104.19	40.7	2.56
Mar.	104.86	40.8	2.57
Apr.	103.94	40.6	2.56
May	105.93	40.9	2.59
June	103.88	39.8	2.61
July	108.75	41.2	2.64
Aug.	109.34	40.8	2.68
Sept.	108.40	40.6	2.67
Oct.	108.14	40.5	2.67
Nov.	112.73	41.3	2.73
Dec.	112.34	41.3	2.72
1958			
Jan.	110.30	40.7	2.71

Source: BLS United States Department of Labor.

U.S.A. New Supply, Consumption, Exports, and Stock of Reclaimed Rubber

(Long Tons)

Year	New Supply	Consumption	Exports	Stocks
1954	258,101	249,049	10,232	30,746
1955	326,649	312,781	13,988	31,498
1956	287,220	270,547	13,832	34,969
1957				
Jan.	25,103	24,053	1,288	34,552
Feb.	21,896	22,773	1,263	32,010
Mar.	25,088	24,633	1,298	30,975
Apr.	22,878	23,145	1,201	30,258
May	24,884	23,816	1,277	29,847
June	22,402	21,352	1,083	30,378
July	20,444	19,676	757	29,972
Aug.	20,423	22,429	917	28,521
Sept.	19,892	21,704	714	25,983
Oct.	26,419	24,925	1,230	27,171
Nov.	22,083	20,583	1,150	27,855
Dec.	20,101	18,263	843	29,323
Totals*	273,989	266,852	13,021	29,323
1958				
Jan.	21,159	21,186	892	29,569
Feb.	18,319	18,130	665	28,838
Mar.*	19,601	19,300	...	28,984

Source: Bureau of the Census, Industry Division, Chemicals Branch, United States Department of Commerce.
* Preliminary.

U.S.A. Rubber Industry Sales and Inventories

(Millions of Dollars)

	Value of Sales*				Manufacturers' Inventories*			
	1955	1956	1957	1958	1955	1956	1957	1958
Jan.	424	415	496	448	790	935	1,047	1,100
Feb.	440	445	495	413	782	970	1,036	1,087
Mar.	466	451	476	...	805	979	1,030	....
Apr.	445	445	490	...	784	970	1,031	....
May	465	464	481	...	810	985	1,024	....
June	465	450	458	...	850	975	1,027	....
July	471	459	514	...	853	987	1,045	....
Aug.	456	436	481	...	863	1,007	1,074	....
Sept.	456	429	481	...	874	1,007	1,074	....
Oct.	447	454	490	...	902	1,022	1,097	....
Nov.	482	463	431	...	935	1,024	1,101	....
Dec.	465	461	427	...	934	998	1,092	....
Total	5,493	5,372	5,720	...	Av. 845	988	12,678	....

Source: Office of Business Economics, United States Department of Commerce.
*Adjusted for seasonal variation.

U.S.A. Rubber Use by Products

(1,000 Long Tons)

	Transportation			Non-Transportation			
Year	Natural	Synthetic	Total	Natural	Synthetic	Total	Grand Total
1952	303.2	539.4	842.6	150.6	267.7	418.3	1,260.9
1953	358.2	500.3	858.5	195.3	284.7	479.8	1,338.3
1954	386.3	391.0	777.3	210.0	245.8	455.7	1,233.0
1955	409.6	550.3	959.9	225.2	344.7	569.8	1,529.7
1956	364.0	533.0	897.0	198.1	341.3	539.5	1,436.5
1957							
1st q.	94.8	152.9	247.7	52.5	91.5	144.0	391.7
2nd q.	85.4	142.7	228.1	47.8	84.3	132.1	360.2
3rd q.	81.7	143.6	225.3	46.7	82.2	129.1	354.4
4th q.	80.9	154.1	225.0	50.0	87.7	137.7	362.7
Year	342.7	583.5	926.2	197.0	345.8	542.9	1,469.0

Source: Secretariat of the International Rubber Study Group.

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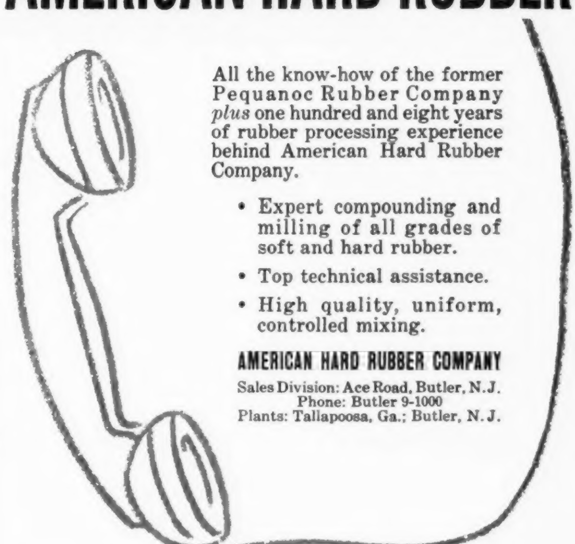

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U.S.A. Automotive Pneumatic Casings

(Thousands of Units)

	Shipments					
	Original Equip-ment	Re-place-ment	Export	Total	Produc-tion	Inven-tory End of Period
Passenger Car						
1957						
Jan.	3,192	4,521	100	7,812	8,296	16,978
Feb.	3,017	4,453	68	7,538	8,047	17,376
Mar.	3,051	4,875	80	8,006	8,629	18,065
Apr.	2,809	5,218	78	8,104	7,878	17,821
May	2,831	5,166	60	8,057	8,313	18,050
June	2,623	5,532	63	8,217	7,462	17,322
July	2,719	5,826	65	8,611	7,449	16,097
Aug.	2,886	5,675	66	8,627	7,801	15,348
Sept.	1,398	5,096	70	6,564	7,535	16,310
Oct.	2,298	4,392	88	6,778	8,437	17,998
Nov.	3,179	3,250	62	6,491	6,575	15,596
Dec.	2,803	2,858	78	5,739	6,597	19,818
Total	32,724	56,605	888	90,217	93,547	19,818
1958						
Jan.	2,376	4,838	50	7,264	6,740	19,298
Feb.	1,998	3,777	57.5	5,833	6,320	19,820
Mar.	1,845	4,726	49.3	6,621	6,569	19,786
Truck and Bus						
1957						
Jan.	305	678	83	1,066	1,208	3,512
Feb.	344	598	59	1,001	1,122	3,633
Mar.	330	704	74	1,107	1,136	3,678
Apr.	438	771	49	1,277	1,072	3,486
May	399	620	74	1,094	1,178	3,580
June	370	715	64	1,149	1,027	3,461
July	349	819	61	1,229	994	3,219
Aug.	328	813	65	1,206	1,117	3,129
Sept.	290	805	63	1,158	1,105	3,083
Oct.	322	959	94	1,375	1,271	2,987
Nov.	337	626	59	1,021	1,060	3,207
Dec.	266	484	70	820	1,018	3,408
Total	4,041	8,544	845	13,430	13,394	3,408
1958						
Jan.	277	674	57	1,007	1,074	3,470
Feb.	254	598	52	904	994	3,572
Mar.	269	608	46	923	1,004	3,659
Total Automotive						
1957						
Jan.	3,496	5,199	183	8,878	9,504	20,490
Feb.	3,361	5,052	127	8,539	9,169	21,009
Mar.	3,381	5,579	154	9,114	9,766	21,743
Apr.	3,246	5,989	146	9,381	8,950	21,308
May	3,230	5,787	134	9,150	9,490	21,630
June	2,993	6,247	127	9,366	8,489	20,783
July	3,068	6,646	126	9,840	8,443	19,316
Aug.	3,214	6,488	130	9,833	8,917	18,477
Sept.	1,688	5,902	133	7,723	8,641	19,393
Oct.	2,620	5,351	182	8,154	9,708	20,985
Nov.	3,516	3,876	121	7,513	7,636	18,803
Dec.	3,070	3,341	148	6,559	7,615	23,225
Total	36,764	65,150	1,734	103,647	106,941	23,225
1958						
Jan.	3,653	5,511	107	8,271	7,814	22,769
Feb.	2,253	4,374	110	6,737	7,314	23,392
Mar.	2,114	5,334	95	7,543	7,573	23,446

Source: The Rubber Manufacturers Association, Inc.

U.S.A. Production of Cotton, Rayon, and Nylon Tire Fabrics

	Cotton and Nylon*		Rayon Tire Cord		
	Cotton Chafer Fabrics and Other Tire Fabrics	Cotton and Nylon Tire Cord and Fabrics	Woven	Not Woven	Total All Tire Cord and Fabrics
1957					
Jan.-Mar.	11,028	20,676	69,610	21,872	124,297
Apr.-June	10,456	24,852	63,195	16,037	115,418
July-Sept.	9,102	24,852	54,968	10,509	100,046
Oct.-Dec.	9,207	23,868	58,356	9,216	100,647
1958					
Jan.-Mar.	9,750	18,280	56,522	8,372	167,924

* Cotton and nylon figures combined to avoid disclosing data for individual companies.
Source: Bureau of the Census, United States Department of Commerce.

U.S.A. Rubber Industry Employment, Wages, Hours

Year	Production Workers (1000's)	Average Weekly Earnings	Average Weekly Hours	Average Hourly Earnings	Consumer's Price Index
		All Rubber Products			
1939	121	$27.84	39.9	$0.75	
1955	214.7	87.15	41.7	2.09	114.5
1956	211.1	87.23	40.2	2.17	116.2
1957					
Jan.	216.0	91.21	40.9	2.23	118.2
Feb.	212.6	90.80	40.9	2.22	118.7
Mar.	211.4	89.28	40.4	2.21	118.9
Apr.	191.3	87.60	40.0	2.19	119.3
May	204.6	88.80	40.0	2.22	119.6
June	196.8	91.21	40.9	2.23	120.2
July	199.9	94.16	41.3	2.28	120.8
Aug.	204.3	92.84	40.9	2.27	121.0
Sept.	206.4	93.02	40.8	2.29	121.1
Oct.	209.5	93.03	40.1	2.32	121.1
Nov.	209.0	93.20	40.0	2.33	121.6
Dec.	207.3	92.40	40.0	2.31	121.6
1958					
Jan.	200.6	87.71	38.3	2.29	122.3
Feb.	....	.....	...	...	122.5
		Tires and Tubes			
1939	54.2	$33.36	35.0	$0.96	
1955	88.6	101.09	41.6	2.43	
1956	85.2	100.95	39.9	2.53	
1957					
Jan.	87.4	107.64	41.4	2.60	
Feb.	86.8	106.19	41.0	2.59	
Mar.	86.9	102.40	40.0	2.56	
Apr.	71.1	103.46	40.1	2.58	
May	84.9	103.46	40.1	2.58	
June	78.2	107.23	41.4	2.59	
July	84.4	112.20	42.5	2.64	
Aug.	84.2	107.83	41.0	2.63	
Sept.	84.4	107.20	40.3	2.66	
Oct.	84.4	105.18	39.1	2.69	
Nov.	84.0	106.62	39.2	2.72	
Dec.	83.6	105.84	39.2	2.70	
1958					
Jan.	81.5	98.52	36.9	2.67	
		Rubber Footwear			
1939	14.8	$22.80	37.5	$0.61	
1955	18.2	70.70	40.4	1.75	
1956	19.8	71.89	39.5	1.82	
1957					
Jan.	18.3	71.76	39.0	1.84	
Feb.	17.8	72.10	39.4	1.83	
Mar.	17.8	72.86	39.5	1.84	
Apr.	17.5	70.64	38.6	1.83	
May	17.3	71.92	39.3	1.83	
June	17.4	72.29	39.5	1.83	
July	16.9	72.13	39.2	1.84	
Aug.	17.2	73.05	39.7	1.84	
Sept.	17.6	74.45	39.6	1.88	
Oct.	17.7	76.02	39.8	1.91	
Nov.	18.0	78.96	40.7	1.94	
Dec.	17.9	79.35	40.9	1.94	
1958					
Jan.	17.7	76.42	39.8	1.92	
		Other Rubber Products			
1939	51.9	$23.34	38.9	$0.61	
1955	107.9	78.35	41.9	1.87	
1956	106.1	78.96	40.7	1.94	
1957					
Jan.	110.3	81.39	40.9	1.99	
Feb.	108.0	81.18	41.0	1.98	
Mar.	106.7	81.19	40.8	1.99	
Apr.	102.7	79.60	40.2	1.98	
May	102.2	79.80	40.1	1.99	
June	101.2	81.81	40.7	2.01	
July	98.6	82.62	40.7	2.03	
Aug.	102.9	83.84	41.1	2.04	
Sept.	104.4	85.08	41.1	2.07	
Oct.	107.4	86.10	41.0	2.10	
Nov.	107.0	85.05	40.5	2.10	
Dec.	105.8	84.03	40.4	2.08	
1958					
Jan.	101.4	80.94	39.1	2.07	

Source: BLS, United States Department of Labor.

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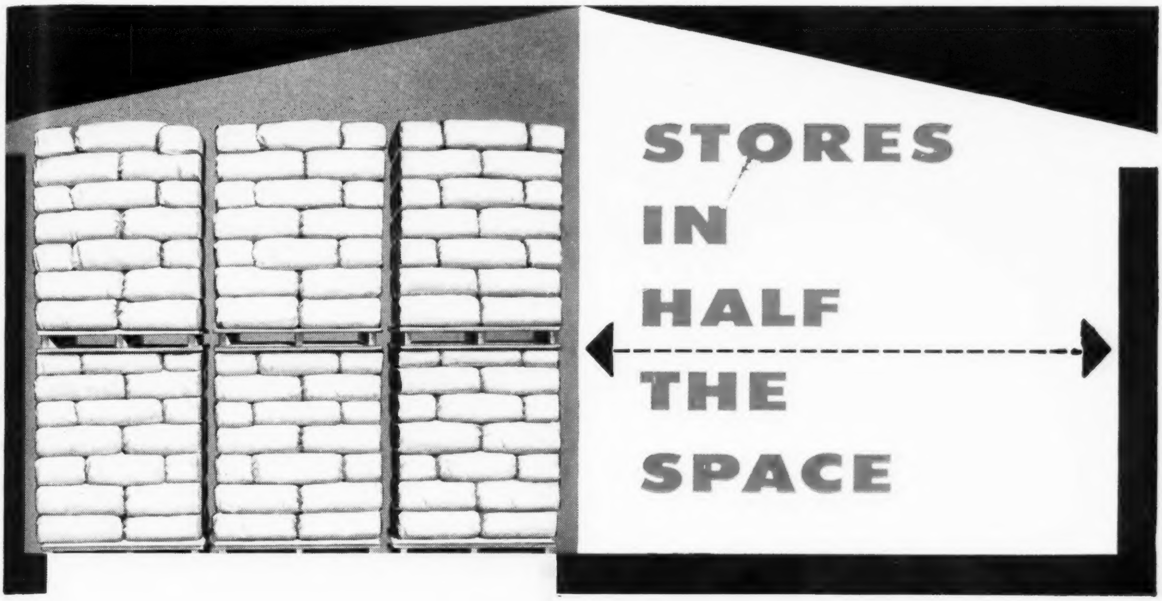

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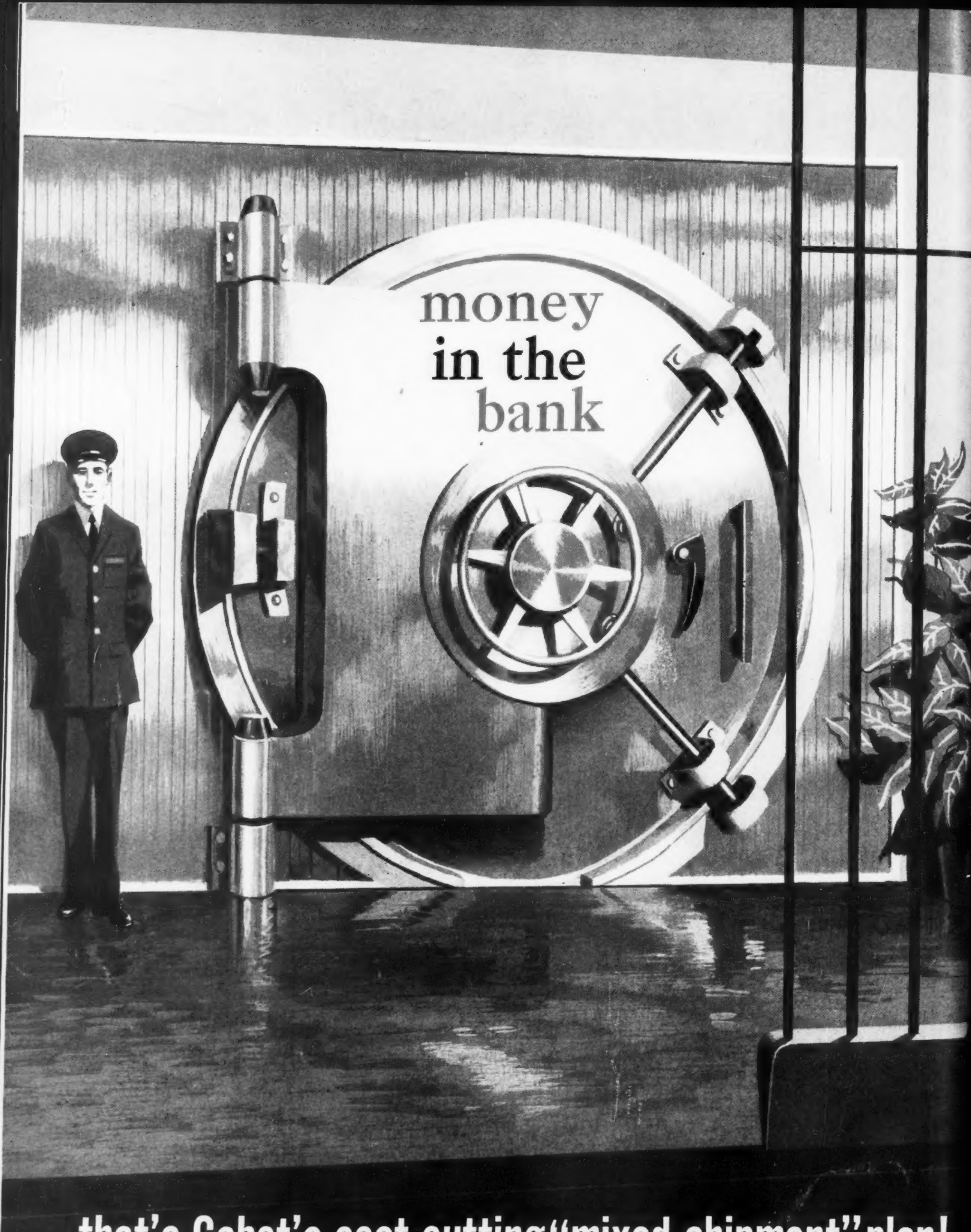
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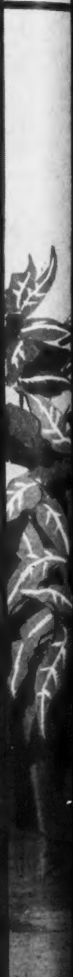

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